

THE UNIVERSITY OF HULL

‘We suffered in silence’: Health and Safety at Chatham Dockyard, 1945 to 1984. Evaluating the causes and management of occupational hazards, relating especially to asbestos, ionising radiation and masculinity.

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by

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Abstract

This thesis is designed to enhance knowledge and understanding of a range of issues relating to the health and safety of the workforce at Chatham Dockyard from 1945 until its closure in 1984. During this period, the Chatham Dockyard workforce was predominantly white, male and working class. Many workers entered the Dockyard with the expectation of a job for life, while others aimed to take advantage of the superior education system to advance to management grades or to progress to further education and/or a career in naval architecture. The majority of workers lived locally and generations of families from the Medway area earned their living in the Dockyard. Casual workers were also employed and came and went as labour requirements fluctuated, while women occupied positions in clerical, cooking, cleaning, sailmaking, ropemaking and, latterly, traditional male roles such as engineering, slinging and plumbing.

A key objective of this study is to establish how dangerous it was to work in the Dockyard, with particular reference to the significant hazards posed by asbestos and ionising radiation. The effectiveness of efforts to mitigate the risks of Dockyard labour is assessed, while the health and safety legislative framework is explored, as is its application to the Dockyards. Gauging the influence of an overtly masculine culture on worker safety, which is central to understanding how and why workers endangered themselves (consciously or not) in some circumstances, is a further objective of this study. In order to establish the masculine culture of this working environment, masculine behaviour traits are explored including camaraderie, provider mentality, risk taking and attitudes toward female workers (especially those working in traditionally male roles). Management strategies are also considered, with Admiralty/Ministry of Defence and local management policies set in their historical and legislative contexts in an attempt to shed light on the factors that informed decision making and management behaviour. This encompasses an account of the comprehensive educational and medical facilities provided to the Dockyard's labour force in the period.

In addition to the review of relevant secondary literature, the study utilises a range of documentary and life history sources. The latter include interviews and questionnaires completed by former workers, relating to work experiences, culture and the impact of industrial injury/disease. This evidence reveals a combination of causal factors that contributed to dangerous working conditions at Chatham Dockyard. While shipbuilding and ship-repairing work itself could be perilous, the study identifies the following contributory factors to risk: competing priorities impacted on the level of protection afforded to workers by the Admiralty and latterly the Ministry of Defence; masculine culture among workers increased the risk of succumbing to occupational illness or injury; and where legislation and Admiralty/MoD policy sought to address risks, these efforts were frequently hampered by communication failure, gaps in knowledge and poor management decisions.

The study opens a discourse on the history of health and safety in the Royal Dockyards after 1945 and contributes to the historiographies of the use and impact of asbestos and nuclear power in industry. It also adds to literature in the fields of naval, maritime, labour, gender and medical history, while the testimony collected during the study makes an important contribution to the life history of Chatham Dockyard and builds on existing oral histories of the Royal Dockyards.

Disclaimer

The material used for this study does not knowingly contravene copyright, defamation, data protection, official secrets or freedom of information legislation. Interviewees and questionnaire respondents were made aware of the intended use of the information that they supplied and any request to remain anonymous was honoured. No defamatory comments have been reproduced in this thesis. It was made clear that the intention was to deposit copies of recordings and questionnaires with either the Royal Dockyard Library or the Chatham Dockyard Historical Society in order that future researchers may interrogate them. The UK Data Archive ethical principles (Appendix 7) were adopted during the study and ethics approval was obtained from the University of Hull.

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Glossary

AEC	Atomic Energy Commission
ALARA	As Low As Reasonably Achievable
ALARP	As Low As Reasonably Practicable
ARD	Asbestos Related Disease
AS	Admiral Superintendent
BEAR	Biological Effects of Atomic Radiation
BNFL	British Nuclear Fuels Limited
BR	Book of Reference
CCDRW	Campaign for Chatham Dockyard Radiation Workers
CDHS	Chatham Dockyard Historical Society
CHDT	Chatham Historic Dockyard Trust
CRUD	Chalk River Unidentified Deposits
FOI	Freedom of Information
GAG	A GAG (not an acronym) was placed on the safety valve of a boiler to stop it letting off steam when maximum pressure was exceeded.
HSE	Health and Safety Executive
HSWA	Health & Safety at Work Act, 1974
HWE	Healthy Worker Effect
ICRP	International Commission on Radiation Protection
INM	Institute of Naval Medicine
IUAC	International Union Against Cancer
MDG(N)	Medical Director General Naval
MoD	Ministry of Defence
MoL	Ministry of Labour
MPD	Maximum Permissible Dose
MRC	Medical Research Council
mSv	MilliSievert
NAS	National Academy of Sciences
NHS	National Health Service
NRPB	National Radiological Protection Board
PRU	Pneumoconiosis Research Unit
PTO	Professional and Technical Officer
RDL	Royal Dockyard Library
RFA	Royal Fleet Auxilliary
RIC	Radiation Induced Cancer
RNC	Royal Naval College
RPS	Radiation Protection Service
SSBN	Nuclear submarine equipped to fire ballistic missiles
SSN	Nuclear powered attack submarine
T&N	Turner & Newall
T&NA	Turner & Newall Archive
TNA	The National Archives
UKAEA	United Kingdom Atomic Energy Association

Chapter 1

Introduction

Chatham Dockyard has been categorised as one of the five hundred places that made British history.¹ Although, journalist, Clive Aslet's comments focus mainly on the Ropery and Horatio Nelson's flagship at Trafalgar, HMS *Victory*, which was built at the Dockyard in 1765, the Dockyard's historical significance can be demonstrated much further.² Established during the reign of Queen Elizabeth I, the Dockyard was one of Britain's first industrial enterprises and performed a key role in the defence of this island nation, from literally guarding the entrance to the River Thames in its earliest incarnation through to building and maintaining the British Naval Fleet.³ It was from Chatham Dockyard that Nelson joined his first ship, HMS *Raisonnable*, in 1771. The Dockyard built over 500 warships, ranging from naval pinnaces and the first-rates that took part in the Battle of Trafalgar to ironclads and latterly conventional submarines. Its most recent task was the refitting of the nuclear powered hunter killer submarines of the Cold War era.

Before its closure in 1984, Chatham Dockyard was one of the most significant employers in the Medway Towns of Chatham, Gillingham and Rochester. Indeed, some workers, especially apprentices, commuted from North Kent and as far away as the Kent coast to work in the Dockyard. The Speed Report compared it to major employers like Vauxhall Motors, Metal Box and the National Freight Corporation.⁴ Employing between 6,000 and 14,500 workers per annum between 1900 and 1984, the Dockyard had a profound impact on the development of the surrounding towns and villages and on the people who worked there. While it unquestionably brought educational and economic

¹ C. Aslet *Landmarks of Britain: Five Hundred Places That Made Our History* (London: Hodder and Stoughton, 2005), p62-3. Aslet is a journalist and editor-at-large for *Country Life* magazine.

² MacDougall provides a detailed account of HMS *Victory*'s history, including its initial 12 year stint in Ordinary from 1783 and its role as a hospital ship for enemy sick and wounded from 1797 (see P. MacDougall *The Chatham Dockyard Story*, pp70-77).

³ For more on the early history of the Dockyard, including its establishment and extension, see P. MacDougall *Chatham Dockyard: The Rise and Fall of a Military Industrial Complex* (Gloucestershire: The History Press, 2012), pp8-23.

⁴ J. Fisher *Medway Disaster: A Report produced for TGWU Region No 1* (University of Surrey, November 1981), p10. The full title of Keith Speed's report was: *The Royal Dockyards: A Framework for the Future: Consultative Document on the Dockyard Study* (1980).

benefits to the region, the Dockyard was a dangerous place to work and left a legacy of occupational illness, which is still affecting the lives of former workers nearly 30 years after its closure.

Chatham Dockyard presented a complete working community contained within an exclusive and highly secretive environment. Its working practices, employment policies, indeed the attitudes of the workers themselves, reflected the social, economic and political changes that occurred within Britain throughout the Dockyard's operational history. Yet Chatham Dockyard was also part of a unique collection of military industrial complexes that employed civilians to build and maintain HM Fleet. Their workers were unionised like their counterparts in the private sector, but also categorised as civil servants and bound by the Official Secrets Acts. The Chatham Dockyard worker, for much of the post-1945 period, was at once working class and well educated, not highly paid, but enjoyed job security with a pension in old age for many. Unlike workers in the private sector, a large contingent of the workforce was employed permanently and as such a strong identity and culture evolved among industrial workers. Workers were also highly patriotic and very aware of the secrecy surrounding much of their work. The Dockyard was fiercely male dominated. Its workforce, therefore, offered an opportunity to understand working-class masculinity within an environment that encouraged learning and skill and provided some means for social mobility. Combined with the dangerous nature of much of the work and its military significance, the Dockyard workforce makes an ideal case study for the exploration of occupational hazard and disease impacts. Examples of a wide range of risks included ever present ones, such as falling from height or being crushed by heavy objects and the intangible effects of asbestos and ionising radiation.

This thesis is designed to enhance knowledge and understanding of a range of issues relating to the health and safety of the workforce at Chatham Dockyard from 1945 to 1984. It seeks to establish the dangerous nature of work in the Dockyard, as identified from former workers' testimony, contemporary documents and secondary sources. The thesis pays particular attention to the significant hazards posed by asbestos and ionising radiation. The effectiveness of efforts to mitigate the risks of Dockyard labour are assessed, while the health and safety legislative framework is explored, as is its application to the Dockyards, which were protected to some extent by Crown Immunity. Gauging the influence of an overtly masculine culture on worker safety, which is key to understanding how and why

workers endangered themselves (consciously or not) in some circumstances, is a further objective of this study. Management strategies are also considered, with Admiralty/Ministry of Defence and local management policies set in their historical and legislative contexts in an attempt to shed light on the factors that informed decision making and management behaviour. In this regard, the study focuses on management handling of the asbestos and radiation risks to assess whether the different treatment of the two hazards reflected competing priorities and unofficial operating practices, which had a negative impact on individual safety.

In addition to the review of relevant secondary literature, the study utilises a range of documentary and life history sources. The latter include interviews and questionnaires completed by former workers, relating to work experiences, culture and the impact of industrial injury/disease. This approach, which combines qualitative, quantitative, personal and official evidence, is particularly fitting to this subject, which simultaneously considers the very official Admiralty/MoD and Dockyard policy with its very personal consequences, i.e. the health of the worker. The evidence reveals a combination of causal factors that contributed to dangerous working conditions at Chatham Dockyard. While shipbuilding and ship-repairing work itself could be perilous, the study postulates that the following factors contributed to risk: competing priorities impacted on the level of protection afforded to workers by the Admiralty and latterly the Ministry of Defence; masculine culture among workers increased the risk of succumbing to occupational illness or injury; and where legislation and Admiralty/MoD policy sought to address risks, these efforts were frequently hampered by communication failure, gaps in knowledge, poor management decisions and unofficial operating practices. These hypotheses were drawn from primary and secondary sources. For instance, while collecting testimony from former Chatham Dockyard workers, it quickly became clear that a strong masculine culture existed within the Dockyard. Chapter 3 explores the extent to which masculine behaviour traits, such as those identified by Iacuone, Beynon, Johnston and McIvor and others, were exhibited by Dockyard workers and how far they rendered the work place unsafe. Also, Tweedale, McCulloch, Johnston and McIvor have found that many employers put profit before the health and safety of their workers when it came to the asbestos threat (demonstrated in chapter 5).⁵ The thesis also

⁵ G. Tweedale *Magic Mineral to Killer Dust: Turner & Newall and the Asbestos Hazard* (Oxford: OUP, 2000); J. McCulloch and G. Tweedale *Defending the Indefensible: The Global Asbestos Industry and its Fight*

explored the relevancy of this to the Dockyards, which were not driven by profit in the same way. A key theme drawn from Johnston and McIvor's research and from primary sources was that the Admiralty/MoD afforded greater protection against asbestos dust to its employees in the Royal Dockyards. Chapter 5 examines the extent to which this was true and later this investment in the investigation and mitigation of the asbestos risk is compared to the relative lack of attention paid to ionising radiation. It is postulated that competing priorities accounted for these differences. The thesis also applies Paap's 'unofficial cultural rules' (explained in chapter 4) in order to establish whether similar practices could have contributed to occupational injury and disease among Dockyard workers.

The history of Chatham Dockyard from 1945 to 1984 does not boast a rich historiography. Lunn and Day observed that studies of the Dockyards are primarily concerned with the eighteenth and nineteenth centuries and overwhelmingly focused on architecture, ships and celebrated men. The history of the workforce is no longer absent from this historiography, with a number of recent autobiographical works (detailed below) adding to publications by Coats, Day and Pritchard, MacDougall and Waters.⁶ Coats' article on Bermuda Dockyard workers and management in 1790 also provides important insight into the employment and treatment of slaves by the Navy in the late eighteenth century.⁷ Women are also being written into the Dockyards' history. Day has contributed important work based on interviews with women who worked in Portsmouth Dockyard before and during the Second World War, a period when women took on traditionally male roles, albeit temporarily.⁸ In a genealogy dissertation, Pauline Ashby draws attention to the fact that women also took on 'male' roles in the Dockyard during the First World War.⁹ Bartram and Shobbrook's article on gender relations at Devonport Dockyard provides a rare consideration of female workers in the post-1945 period, including those employed in

for Survival (Oxford: OUP, 2008); R. Johnston and A. McIvor *Lethal Work: A History of the Asbestos Tragedy in Scotland* (East Lothian: Tuckwell Press, 2000).

⁶ A. Coats 'Bermuda Naval Base: Management, Artisans and Enslaved Workers in the 1790s' *Mariner's Mirror* 95:2 (2009); A. Day and G. Pritchard *Staying Afloat: Recollections of Portsmouth Dockyard 1950-present day* (University of Portsmouth, 1999); P. MacDougall 'The Changing Nature of the Dockyard Dispute, 1790-1840' in K. Lunn, and A. Day (eds) *History of Work & Labour Relations in the Royal Dockyards* (London: Mansell, 1999); see also the review of Mavis Waters' works below.

⁷ Coats 'Bermuda Naval Base'.

⁸ Day 'The Forgotten 'Mateys'.

⁹ P. Ashby "*Ladies*" of the Colour Loft and Ropery Women: A Study of Female Employment in the Royal Dockyard at Chatham 1901-1920 (University of London Dissertation, 1991).

traditionally male roles.¹⁰ Women had in fact first been employed in the Dockyards during the Napoleonic Wars. They worked in rope and colour (flag and signal) making, though they were few in number and did not work alongside the men. Joan Ryan, in her analysis of females employed in these roles in the Dockyards at Chatham and Devonport during the nineteenth century,¹¹ observes that the women may have been overlooked in previous studies because the official records listed them as ‘hired men’ and ‘spinning operatives’.¹² Ryan also refers to the segregation of female workers,¹³ a practice that had ceased by the period of the current study. Ashby’s work also considers the class distinctions applied to work in the colour loft and in the ropery, finding that migration of workers between the two departments refuted this common belief somewhat.¹⁴ Indeed, the integration of women into traditionally male areas of work in the 1970s formed an important part of my research into masculine culture.

Given the dearth of learned works on Chatham Dockyard’s post 1945 history, it is unsurprising that the equally under researched area of health and safety in the Dockyards yields few useful published sources. Like Biddle’s article on Portsmouth Dockyard workers, the current study ‘treads virgin ground’.¹⁵ While occupational hazards and the more publicised accidents in Chatham Dockyard have received brief attention from scholars, there have been no detailed studies of the working conditions, injury and illnesses that workers suffered through their employment. Consequently, the present study relies heavily on empirical research and on appraisals of the private shipbuilding sector and other cognate industries, notably those by Johnston and McIvor, Johnman, Johnston and Mackenzie, Paap, Murphy, Arnold and Tweedale.¹⁶

¹⁰ R. Bartram and S. Shobrook ‘You have to be twice as good to be equal: ‘placing’ women in Plymouth’s Devonport Dockyard’ *Area* 30:1 (1998).

¹¹ J. Ryan ‘Women Naval Dockyard Workers in two 19th Century Dockyard Towns: Chatham and Plymouth’ (MPhil thesis, University of Greenwich, 2011).

¹² Ryan ‘Women Naval Dockyard Workers’, p122.

¹³ Ryan ‘Women Naval Dockyard Workers’ p1.

¹⁴ Ashby “*Ladies*” of the Colour Loft and Ropery Women.

¹⁵ R. Biddle ‘Naval Shipbuilding and the Health of Dockworkers c.1815-1871’ *Family & Community* 12:2 (2009), p107.

¹⁶ Johnston and McIvor *Lethal Work*; R. Johnston and A. McIvor ‘Dangerous Work, Hard Men and Broken Bodies: Masculinity in the Clydeside Heavy Industries’ *Labour History Review* 69:2 (August 2004); L. Johnman, I. Johnston and I. Mackenzie *Down the River* (Glendaruel: Argyll Publishing, 2001); K. Paap *Working Construction: Why White Working-Class Men put Themselves – and the Labor Movement – in Harm’s Way* (Ithaca: Cornell University Press, 2006); H. Murphy ‘The Health of Electric Arc Welders and

Earlier periods of Chatham Dockyard's history have been covered in detail by Philip MacDougall,¹⁷ whose most recent work concentrates primarily on the impact of the Industrial Revolution on the Dockyard. There is some discussion of the post-1945 period and the current use of the Dockyard site as a living museum, topics that are covered even more briefly in the two editions of *The Chatham Dockyard Story*. Most relevant to this thesis is the brief mention of the nuclear radiation workers who contracted cancers as a result of their work and of the asbestos hazard.¹⁸ There are a number of references to other works that lack full citation in either the footnotes or the bibliography. For example, there is no indication as to the location of the potentially revealing communiqué by Rear-Admiral G.V.M. Dolphin, which MacDougall cites on pages 153-4.

James Presnail's study ranges from the prehistoric times to the late nineteenth century, but its accuracy is questionable in places.¹⁹ For example, an entire chapter is devoted to the construction of Henry VII's galleon the 'Great Harry' (*Henry Grace a Dieu*), which Presnail claims to have been built at Chatham Dockyard in 1488. Today this ship is widely believed to have been built at Woolwich Dockyard (or possibly Erith) c1514.²⁰ Mavis Waters' works concern the workforce and labour relations from the mid-nineteenth to early twentieth centuries, including the impact of the transition from wood to iron and iron to steel building materials.²¹ Her two part article on the changing workforce in the

the Adoption of Arc Welding in the British Shipbuilding Industry, 1930-51' *International Journal of Maritime History* 17:1 (2005); L. Arnold *Windscale 1957: Anatomy of a Nuclear Accident* (Hampshire: Palgrave MacMillan, 2007) and Tweedale *Magic Mineral to Killer Dust*.

¹⁷ MacDougall's works include: *The Chatham Dockyard Story* (Kent: Rochester Press, 1981); *The Royal Dockyards* (Newton Abbot: David & Charles, 1982); *The Chatham Dockyard Story: Revised and Expanded Edition* (Rainham: Meresborough Books, 1987); 'The Changing Nature of the Dockyard Dispute'; *A Century of Chatham: Events, People and Places over the Last 100 Years* (Swindon: WHSmith, 2002); *Chatham Dockyard: The Rise and Fall of a Military Industrial Complex* (Gloucestershire: The History Press, 2012); *Chatham Past* (West Sussex: Phillimore & Co. Ltd., 1999); *Chatham Dockyard in Old Photographs* (Gloucestershire: Alan Sutton Publishing, 1994).

¹⁸ MacDougall *Chatham Dockyard*, pp162-5.

¹⁹ J. Presnail *Chatham: The Story of a Dockyard Town and the Birthplace of the British Navy* (Chatham: The Corporation of Chatham, 1952). MacDougall refers to the inaccuracy of Presnail's work in *The Chatham Dockyard Story* (1981), p7.

²⁰ J.J. Colledge (Revised by Lt-Cdr B Warlow) *Ships of the Royal Navy: The Complete Record of all Fighting Ships of the Royal Navy from the Fifteenth Century to the Present* (London: Greenhill Books, 2003); MacDougall *Royal Dockyards*, p29; J.D. Crawshaw *The History of Chatham Dockyard* (Published privately in Newcastle-upon-Tyne: Isabel Garford, 1999), p1/1.

²¹ Waters' works include: 'Craft Consciousness in a government enterprise: Medway dockyardmen 1860-1906' *Oral History* 5:4 (1977); 'The Dockyard Work-Force: A Picture of Chatham Dockyard c.1860' *Archaeologia Cantiana* 97 (1981); 'Changes in the Chatham Dockyard Workforce, 1860-90. Part I: From

Dockyard provides helpful background in terms of the development of the trades and inter-trade relationships that shaped the twentieth century workforce.²² Waters' work serves to highlight the differences and similarities between the pre-1945 workforce and that employed in the Dockyard during the period after the Second World War. For example, before industrialisation, the Dockyard workforce could be split into two groups: the artisans (dominated by shipwrights) and unskilled labourers.²³ This division between the skilled and unskilled continued into the twentieth century and although electrical trades began to threaten the supremacy of the shipwright, it was still considered the 'cream of trades' by many. Waters' contribution to Lunn and Day's volume concentrates on the transition to petitioning as a means for Dockyard workers to voice their grievances and improve their conditions.²⁴ It also considers the Dockyard school briefly and has been used for background in Chapter 2 of this study. Her depiction of the Chatham Dockyard workers as confident and business-like in their petitions to the Admiralty supports the theory that, rather than suffering in silence, Chatham Dockyard workers were actually vociferous when they felt they were being disadvantaged. Waters' PhD study involved interviews with employees who had worked in the Dockyard as boys in the years leading up to the First World War.²⁵ These have not been used for the current study. Rear Admiral J. G. Crace's brief account of the development of the Dockyard and key events in its history from establishment to 1946, includes lists of officers and of ships constructed there. Crace, who was Admiral Superintendent of Chatham Dockyard from 15 October 1942 to 15 July 1946,²⁶ does not claim to have written a complete history, but humbly offers the notes he had collected 'from a variety of sources at odd moments' to assist some future individual to

wood to iron: change and harmony, 1860-87' *Mariner's Mirror* 69:1 (1983); 'Changes in the Chatham Dockyard Workforce, 1860-90. Part II: From iron to steel: change and suspicion 1887-90' *Mariner's Mirror* 69:2 (1983); 'The Dockyardmen Speak Out: Petition and Tradition in Chatham Dockyard, 1860-1906' in Lunn and Day *History of Work & Labour Relations in the Royal Dockyards*, pp87-98; *Some Gleanings from the history of a Dockyard town, Local history Series No 10* (Kent County Library, date unknown).

²² Waters 'Changes in the Chatham Dockyard Workforce, 1860-90. Part I: From wood to iron: change and harmony, 1860-87' and 'Changes in the Chatham Dockyard Workforce, 1860-90. Part II: From iron to steel: change and suspicion 1887-90'.

²³ Waters 'The Dockyard Work-force', p82.

²⁴ Waters 'The Dockyardmen Speak Out'.

²⁵ M. Waters 'Social History of the Chatham Dockyard Work Force, 1860-1906' (PhD thesis, University of Essex, 1979). The recordings from this study are held in the Essex Oral History Archive.

²⁶ *Navy List*

write an accurate history.²⁷ Preston's work may well have been a response to Crace's call.²⁸ The volume is a version of Preston's PhD thesis and looks at the industrial development of Medway from the eighteenth century until 1946. It takes into account military and naval influences on the development of Chatham Dockyard between 1850 and 1900. James D. Crawshaw's two volume privately published history was a useful reference work, though again it is primarily concerned with the Dockyard's pre-1945 history. Crawshaw taught in the Chatham Dockyard School from 1936 until 1970 and spent 25 years researching his book, which was published posthumously by his wife and daughter. His work covers the administration, work, buildings and workers of the Dockyard in a level of detail that other publications rarely offer. It is therefore an excellent source for those wishing to understand *how* things worked at the Dockyard.²⁹ Crawshaw benefited from working in the Dockyard while researching his book. He spent time witnessing the work of the Dockyard and talking to the people who undertook it. Crawshaw also wrote a history of the Dockyard School at Chatham. Though it was never published, a copy is held by TNA and versions were also deposited with the RDL, Chatham Public Library and the National Maritime Museum, Greenwich.³⁰ The Dockyard Schools were also the subject of articles by Neil Casey, J. M. Haas and former pupil, Frank King.³¹ A history of Chatham Dockyard's Medical Service was written by D. S. Wright, who was appointed assistant medical officer at the Dockyard in 1965.³²

Published sources of testimony have also been used in researching the present study. In 1983, three artists from the Royal College of Art produced paintings and drawings of the Dockyard and its employees. Their work was published alongside testimony from workers, some extracted from interviews conducted by the Medway poet Bill Lewis. The

²⁷ J.G. Crace. *Some Notes on the History of Chatham Dockyard* (1946)

²⁸ J.M. Preston *Industrial Medway: an historical survey* (privately published in 1977).

²⁹ Crawshaw *The History of Chatham Dockyard*.

³⁰ NA, ADM 1/26266: *History of Chatham Dockyard School (now known as Dockyard Technical College, Chatham)* by J D Crawshaw; MacDougall misquotes this work as that of a John Crawshaw in *Chatham Dockyard*, p157.

³¹ N. Casey 'Class Rule: The Hegemonic Role of the Royal Dockyard Schools, 1840-1914' in Lunn and Day *History of Work & Labour Relations in the Royal Dockyards*; J. M. Haas 'The Best Investment Ever Made: The Royal Dockyard Schools, Technical Education, and the British Shipbuilding Industry, 1800-1914' *Mariner's Mirror* 76:4 (November 1990); F. King 'The Royal Dockyard Schools and their Education System' *The Mariner's Mirror* 99:4 (November 2013).

³² D. S. Wright 'The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966' *Journal of the Royal Naval Medical Service* 54:1 (Spring 1968).

topics of each piece vary, with an overarching theme of the then impending closure. Some reveal aspects of culture, such as the use of nicknames, while 'The Boilermaker's Tale' is a brief account of the explosion of a steam crane boiler that is detailed in chapter 3 of this thesis. Chris Andrews' memoirs cover his four years of apprenticeship, which started in 1955, and his subsequent career as an electrical engineer in the Dockyard until 1982.³³ As well as confirming some of the historical facts known about the Dockyard in this period, Andrews provides insight into how these affected him personally as he progressed from a hesitant young apprentice, who had left home for the first time and was surrounded by strangers, to a qualified man with 26 years' experience who was very sad to leave the Dockyard and his workplace friends. He also refers to reading in the local newspapers about colleagues who lost their lives to asbestos-related disease (ARD). Smith's autobiography contained similar testimony, as well as a significant amount of information about his personal life, some of it quite racy.³⁴ Billy Childish, known for his prolific and explicit literature, alternative art and punk music, was one of the last stonemason apprentices in the Dockyard. He was indentured in 1976 under the name Steven John Hamper. He wrote two fictional works, which were influenced in part by his recollections of the Dockyard.³⁵ They offer an alternative perspective on Dockyard work, as they come from the pen of someone who reluctantly took an apprenticeship and intensely disliked much of his work.

Chatham Dockyard is mentioned in a number of publications regarding Britain's Royal Dockyards.³⁶ Lunn and Day's edited collection brings together academic essays covering different periods, including two that address aspects of the post-1945 period. Alex Law's chapter considers workers' organisation at Rosyth Dockyard from 1945 to 1995, while Lunn's concluding essay looks at the policy decisions that affected the future of the Dockyards and the way that they were managed, particularly the move to private

³³ C.J. Andrews *The Life and Times of a Dockyard Matey* (privately published, 2006).

³⁴ R. Smith *A Dockyard Apprentice's Story: Hard graft, scrapes and japes on the long road to becoming a trained engineer* (Gloucestershire: Memoirs Publishing, 2012).

³⁵ B. Childish *My Fault* (London: Virgin Books Ltd, 2005); B. Childish *The Stonemason (Failure Books 4)* (London: I-13, 2011).

³⁶ J. Coad *The Royal Dockyards 1690-1850* (Hampshire: Scolar Press, 1989); R. J. B. Knight *The Royal Dockyards in England at the Time of the American War of Independence* (University of London: 1972); R. Morriss *The Royal Dockyards during the Revolutionary and Napoleonic Wars* (Leicester University Press: 1983); and K. Lunn and A. Day *History of Work & Labour in the Royal Dockyards* (Mansell Publishing Limited: London, 1999).

management and the closures in the period, including that of Chatham Dockyard.³⁷ An instructive list of ships built in the Dockyard, categorised by period (i.e. sail, steam and sail, iron and armour and modern vessels), is provided in Philip Banbury's short section on Chatham Dockyard. It ends by stating, rather optimistically, that Chatham was the only one of the Dockyards to still be constructing vessels. Sadly, by the time the book was published this statement was no longer true.³⁸

The historiography of industrial health and disease has its origins in the eighteenth century, with its foundation often attributed to the Italian physician Bernardino Ramazzini.³⁹ The research and publications that followed in subsequent centuries, tended to be written by pioneering practitioners, who linked industrial progress with new workplace hazards and offered their own solutions to them.⁴⁰ More recent historical works have moved away from this 'heroic' style and draw from a plethora of historical and social science genres, including social and labour histories, which bring the experiences and agency of workers and other laypeople to the fore. Claudia Clark observes that by the late 1990s historians were 'beginning to piece together a picture of shifting conditions in the workplace and varying responses to them by workers, managers, medical experts, government officials, and reformers', but that industrial health and disease remained largely neglected by historians.⁴¹ Professor Joseph Melling has written on various aspects of occupational health in the UK, including the diagnosis of silicosis, a disease of the lungs

³⁷ A. Law 'Neither Colonial nor Historic: Workers' Organization at Rosyth Dockyard, 1945-95' Lunn and Day (eds) *History of Work & Labour in the Royal Dockyards*, pp151-178; K. Lunn 'The Way Forward? The Royal Dockyards since 1945' in Lunn and Day (eds) *History of Work & Labour in the Royal Dockyards* pp179-192.

³⁸ P. Banbury *Shipbuilders of the Thames and Medway* (Devon: David & Charles, 1971), 92.

³⁹ B. Ramazzini *A treatise of the diseases of tradesmen, Shewing the Various Influence of Particular Trades upon the State of Health, with the Best Methods to Avoid or Correct It, and Useful Hints Proper to Be Minded in Regulating the Cure of All Diseases Incident to Tradesmen* (London: printed for Andrew Bell and eight others, 1705).

⁴⁰ T. Oliver (ed) *Dangerous Trades: The Historical, Social, and Legal Aspects of Industrial Occupations as Affecting Health, by a number of Experts* (London: J. Murray, 1902); T. M. Legge *Shaw Lectures on Thirty Years Experience of Industrial Maladies: Delivered before the Royal Society of Arts, February and March, 1929* (London: Royal Society, 1929); R.S.F. Schilling *Modern Trends in Occupational Health* (London: Butterworths, 1960); G. Rosen *The History of Miners' Diseases: A Medical and Social Interpretation* (New York: Schuman's, 1943); A. Hamilton *Exploring the Dangerous Trades: The Autobiography of Alice Hamilton, M.D.* (Boston: Little Brown, 1943); L. Telekey *History of Factory and Mine Hygiene* (New York: Columbia University Press, 1948).

⁴¹ C. Clark *Radium Girls: Women and Industrial Health Reform, 1910-1935* (Chapel Hill: The University of North Carolina Press, 1997), p5.

with similarities to asbestosis, and the struggle of its victims to obtain compensation.⁴² More recently his work has considered the world wide circulation of workplace dangers, including *Dangerous Trades*, which he co-edited with Professor Christopher Sellers.⁴³ It is one of the key texts to have emerged in recent years and builds on the classic works edited by Weindling, Rosner and Markowitz and includes thirteen essays that are written from different disciplinary perspectives and which consider both workplace and environmental hazards.⁴⁴ Part II of the volume includes eight essays concerning the post-1945 period, including Castleman and Tweedale's consideration of the evolution of the world view of asbestos, from support for the miracle material to the campaign for a global ban on its use.⁴⁵ The book focusses our attention on the proliferation of occupational and ecological hazards in the developing world, where western companies have outsourced dangerous tasks and processes in order to avoid restrictive legislation in their home countries and thereby enjoy greater profits.⁴⁶ The variety of industries and hazards covered is as wide as the geographic spread of the essays, yet shipbuilding, defined by Johnston and McIvor as one of the most dangerous industries in the UK and one where the outsourcing of risk to industrialising nations is particularly evident, is not considered in any depth.⁴⁷ Indeed, the historiography of health and safety and industrial disease in the UK shipbuilding industry in the post-1945 period is limited; even more so when it comes to shipbuilding and ship-repairing in the naval dockyards.

⁴² J. Melling: 'Beyond a Shadow of a Doubt? Experts, Lay Knowledge, and the Role of Radiography in the Diagnosis of Silicosis in Britain, c.1919-1945' *Bulletin of History of Medicine* 84:4 (2010); 'Shadows of doubt: Somerset miners and the struggle for compensation rights for silicosis sufferers *Five Arches. Journal of the Radstock Museum Society* no. 65 (Radstock Museum, 2009); with M. Bufton 'A mere matter of rock: organised labour, scientific evidence and British government schemes for compensating silicosis and pneumoconiosis among coalminers, c.1926-1940' *Medical History* 49 (2005).

⁴³ Melling and Sellers *Dangerous Trades*.

⁴⁴ P. Weindling and the Society for the Social History of Medicine (eds) *The Social History of Occupational Health* (London: Croom Helm, 1985); D. Rosner and G. Markowitz (eds) *Dying for Work: Workers' Safety and Health in Twentieth-Century America* (Bloomington: Indiana University Press, 1987); C. Sellers and J. Melling (eds) *Dangerous Trade: Histories of Industrial Hazard across a Globalizing World* (Philadelphia: Temple University Press, 2012).

⁴⁵ B. Castleman and G. Tweedale 'Turning the Tide: The Struggle for Compensation for Asbestos-related Diseases and the Banning of Asbestos' in Sellers and Melling (eds) *Dangerous Trade*.

⁴⁶ J. Melling and C. Sellers (with B. Castleman) 'Conclusion' in Melling and Sellers *Dangerous Trades*, pp202-4.

⁴⁷ Johnston and McIvor *Lethal Work*, p129.

Beyond mention of Harries' research, the key texts on the history of asbestos-related disease contain little mention of the impact of asbestos on the royal dockyards or on the measures adopted by the Admiralty to address the risks; even less is written on the experiences of civilian workers in the dockyards. Castleman, McCulloch, Tweedale, Bartrip and Maines all, to varying degrees, consider asbestos in the context of shipbuilding, but much of the work relates to private shipbuilding in both the UK and the US.⁴⁸ Johnston and McIvor's research on the impact of asbestos-related disease on those employed in Scottish heavy industry, is one of the few that deals with the UK shipbuilding industry in detail. As one of the biggest of the heavy industries on the Clyde in the post-1945 period, shipbuilding features across their work on asbestos-related disease and on masculinity.⁴⁹ Their work includes useful descriptions of the working environments in Scottish shipbuilding yards and pertinent testimony from former workers, which echo the experiences of Chatham Dockyard workers. *Lethal Work* offers some useful comparison with regard to the reactions of the private shipbuilding companies to the asbestos threat and that of the naval dockyards.⁵⁰ The investment made by the Admiralty to assess and mitigate the asbestos risk makes the dockyards a somewhat unique environment to study.

The dockyards are starkly absent from the historiography of radiation risks. A number of texts cover the emergence of health issues related to radiation exposure in the United States. Journalist, Catherine Caulfield's work is far ranging and provides an historical account of the development of the discovery of nuclear energy and the uses to which it has been put. She also explores the various standards that emerged in the name of protection from radioactivity and considers the extent to which ordinary citizens are exposed to radiation on a daily basis.⁵¹ Cumbrian writer, Hunter Davies' *Sellafield*

⁴⁸ Tweedale *Magic Mineral to Killer Dust*, Maines *Asbestos and Fire*; P. Bartrip *Beyond the Factory Gates: Asbestos and Health in Twentieth Century America* (New York: Continuum International Publishing Group Ltd, 2005), B. Castleman *Asbestos: Medical and Legal Aspects* (New Jersey: Aspen Law & Business, 1996); Castleman and Tweedale 'Turning the Tide' in Sellers and Melling (eds) *Dangerous Trade*; McCulloch and Tweedale *Defending the Indefensible*.

⁴⁹ R. Johnston and A McIvor's collaborative works include: 'Dangerous Work, Hard Men and Broken Bodies: Masculinity in the Clydeside Heavy Industries' *Labour History Review*, 69 (2004); 'Dust to Dust': Oral Testimonies of Asbestos-Related Disease on Clydeside, c1930 to the Present' *Oral History* 29:2 (2001); 'Incubating Death: working with asbestos in Clydeside shipbuilding and engineering, 1945-1990' *Scottish Labour History* 34 (1999); *Lethal Work: A History of the Asbestos Tragedy in Scotland* (East Lothian, Scotland: Tuckwell Press, 2000); and 'Marginalising the Body at Work? Employers' Occupational Health Strategies and Occupational Medicine in Scotland c. 1930-1974' *Social History of Medicine* 21:1.

⁵⁰ Johnston and McIvor *Lethal Work*, p91-2.

⁵¹ C. Caulfield *Multiple Exposures: Chronicles of the Radiation Age* (London: Secker & Warburg, 1989).

Stories recounts the life stories of thirty people whose lives were impacted by Britain's first nuclear facility at Windscale. It is the result of the UK's biggest oral history project, which was generously funded by British Nuclear Fuels Ltd and includes some important testimony about the construction and running of the site. Some testimony also alludes to risks taken in order to produce sufficient weapons grade plutonium. The evidence provided in chapter 6 of this thesis suggests that similar risks were taken in order to ensure the fast turnaround of nuclear submarine refits in Chatham Dockyard.⁵² Lorna Arnold's official history of the Windscale accident in 1957 is now in its third edition and, as Peter Hennessey comments in his introduction to this volume, it addresses the need to keep the story of this near disaster in the public consciousness now that civil nuclear programmes are being renewed.⁵³ Claudia Clark's *Radium Girls* provides an account of perhaps the first victims of occupational radiation-induced cancers outside of the scientific community.⁵⁴ The radium dial painters' struggle for recognition that their illnesses were caused by the radium they worked with, draws some parallels with the experiences of Chatham Dockyard workers, who strived for admission from the MoD that the nuclear radiation they worked with caused their cancers. Kate Brown provides an important study of the Soviet and US plutonium disasters, that promotes consideration of the impact of the nuclear footprint left by the US and Soviet arms race during the Cold War. Brown used official documents and oral testimony from Richland, Washington and Ozersk, Russia, which were the first two places in the world to produce plutonium.⁵⁵ Unlike asbestos, the radiation risk in shipbuilding appears to be completely absent from the historiography, despite the fact that radiation was a risk to workers applying radium paint to dials and instruments for naval and merchant ships and also to workers engaged on non-destructive testing, before the nuclear submarine building and refitting programmes started. These tasks cannot be viewed very differently from any of the other hazard laden jobs in the shipyards and dockyards; they certainly were not in the same restricted category as work on the reactors of nuclear submarines.

⁵² H. Davies (ed) *Sellafield Stories: Life with Britain's First Nuclear Plant* (London: Constable & Robinson Ltd, 2012), pp47-8 and 76-9.

⁵³ Arnold *Windscale 1957*, pvii-viii.

⁵⁴ Clark *Radium Girls*.

⁵⁵ K. Brown *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (Oxford: OUP, 2013).

Within this sparse historiographical context, empirical research for the current study was rendered all the more pertinent. A combination of sources and methods was utilised to yield evidence pertaining to the health and safety of workers engaged at Chatham Dockyard since the Second World War. In identifying life history and documentary sources as essential for the study, the problems associated with such sources were given due consideration, including problems of partiality. Postmodernists claim that we cannot hope to find the ultimate truth concerning events that occurred in the past; the conclusion we arrive at is but one of infinite possible interpretations of available evidence and, furthermore, that each individual's personal experience of the world they live or have lived in is in itself merely an interpretation - there is no historical truth. Fulbrook provides a reasoned argument as to why the postmodernist assertion that 'history is dead' has been overstated:

There are ways of seeking to bridge that gap [between the lost past and historical representations in the present]. Some of these ways are mutually compatible; others less so. But there are also ways of adjudicating between competing accounts. More importantly, the fact that there is no single 'final account' is not necessarily a reason either for not doing history at all (as some postmodernists occasionally seem to believe), or for suggesting that all accounts are in principle equally valid, or equally invented (as other postmodernists appear to suggest). Within the kinds of qualifications discussed [in her book], there remains the possibility of achieving enhanced historical understanding and explanation of selected questions about the past.⁵⁶

Recognising that historical research and representation is essentially theoretical and that some level of subjectivity is unavoidable, it is essential that the historian remains honest, is transparent in the sharing of sources and accepts the potential for the hypotheses to be disproved through further research, by themselves or others. In fact this is true of researchers in all disciplines.⁵⁷ The historian's 'black swan' (to paraphrase Karl Popper⁵⁸) may be lurking in a closed file at The National Archives (TNA) or on a reel of cine film in the private collection of an unaware owner. A combination of Butler's recommendation that the historian may need 'a receptive mind, open to new ideas but tempered by a healthy and constructive scepticism' and Fulbrook's five 'fundamental commitments', may indeed

⁵⁶ M. Fulbrook *Historical Theory* (Taylor and Francis e-Library, 2004), p195.

⁵⁷ Fulbrook *Historical Theory*, p196; L. J. Butler 'History: theory and practice' L.J. Butler and A. Gorst *Modern British History: A guide to study and research* (London: I. B. Tauris Publishers, 1997), p30.

⁵⁸ K. Popper *Logic of Scientific Discovery* (London: Hutchinson Education, 1959).

be a sensible way forward,⁵⁹ for ‘the historian’s job is to analyse and interpret surviving sources and in this respect people’s memories are invaluable fragments of evidence’.⁶⁰

By its very nature this study combines the official with the personal and it was felt that life history would make a particularly fitting means of establishing the Dockyard’s culture and the impact of occupational hazards, injury and disease on the worker. In common with Lummis’ assertion that those who experienced a situation were the best source for understanding socio-industrial attitudes, those who encountered the working conditions in the Dockyard were considered an important source in order to appreciate the culture among workers there.⁶¹ Life history uses sources such as oral history, personal narrative, autobiography and biography. The University of Sussex Centre of Life History and Life Writing Research states:

Life stories capture the relation between the individual and society, the local and the national, the past and present and the public and private experience. Research involves grappling with theories of memory, relationship and self representation, and with debates about literacy and orality.⁶²

This study used various sources that fit under the life history banner, including oral history, memoirs and questionnaires. They have been particularly helpful where documentary evidence has been unavailable, which was especially pertinent to the research that underpins chapter 6. Examples of poems and humour provided by respondents and taken from the Dockyard newspaper have also assisted in proving that a masculine culture existed among Chatham Dockyard workers and this was further evidenced in responses to questions about the appointment of girls and women in traditionally male roles, including the testimony from one former female apprentice, who was interviewed for the study.

With all of these sources the limitations of memory must be considered. As well as the possibility of incomplete recollection, memory can be distorted, selective and impacted by conscious and subconscious suppression and interpretation. In addition, the possibility that the research may be skewed by the prevalence of particular personality types that seek

⁵⁹ Butler ‘History: theory and practice’, p31; Fulbrook *Historical Theory*, pp187-8.

⁶⁰ R. Johnston and A. McIvor ‘“Dust to Dust”: Oral Testimonies of Asbestos-Related Disease on Clydeside, c1930 to the Present’ *Oral History* 29:2 (2001), p60.

⁶¹ T. Lummis ‘The Occupational Community of East Anglian Fishermen: An Historical Dimension Through Oral Evidence’ *The British Journal of Sociology* 28:1 (March 1977), p52.

⁶² <http://www.sussex.ac.uk/clhlwr/about>.

to share their recollections, should be considered. Further, there is the influence and agenda of the researcher in interviews and questionnaires. Simply by choosing a subject or selecting questions to use in an interview, the outcome of a study can be influenced. Abrams concluded that the interview is a three-way conversation between the interviewer, interviewee and culture, which the historian must analyse and decode.⁶³

Similar problems exist with documentary sources too, which often rely on memory and/or interpretation while also being written for a specific purpose. For example, it may be the case that an individual omitted or played down information in a legal case that may implicate contributory negligence, in order for a damage claim to be successful. Life history sources should be approached with these problems in mind and perhaps even with a view to interpreting how the author or interviewee structures their recollections and whether this has significance for the subject under scrutiny. In this study, life history sources were corroborated by contemporary documentary evidence and quantitative data in order to address problems of memory. For example, in some cases, the failure of memory has led to participants misquoting the names of the vessels that they worked on or the dates that they were employed. Using lock logs it was possible to identify the dates that vessels entered and left the Dockyard and this helped to place participants. Likewise, apprentice record cards assisted in the confirmation of joining dates and trade in some cases. The testimony collected from the questionnaires and interviews from this study has also been compared with published memoirs and secondary sources that have employed life history methods.

Changes in the perception of issues in the recent past can influence an individual's recollections or honesty. For example, where participants in this study were asked about their opinion on women undertaking traditionally male roles, it is possible that some gave answers that they considered to be socially acceptable today, but which may not have been true at the time. This may be exacerbated by the fact that participants knew that the study was being conducted by a young female. Hale recorded similar issues when analysing the results of her study of military masculinities.⁶⁴ An individual's position in the social or organisational structure can also shape their answers to questions. A manager may, for

⁶³ L. Abrams *Oral History Theory* (Taylor & Francis e-Library, 2010), p77.

⁶⁴ H. C. Hale 'The Role of Practice in the Development of Military Masculinities' *Gender, Work & Organization* 19:6 (November 2012), p10.

example, state that safety precautions were in place and observed in order to avoid criticism of their work, whereas the employees that reported to them may identify gaps in provision or comprehension.

Oral history techniques were deployed extensively to generate data for this study. As Thompson states, ‘reality is complex and many-sided; it is a primary merit of oral history that to a much greater extent than most sources it allows the original multiplicity of standpoints to be recreated’.⁶⁵ One benefit of oral testimony over written testimony is that it is possible to ask the interviewee to explain comments or elaborate on points, which is not generally possible with authors of contemporary witness statements or journals.⁶⁶ Also, by considering workers’ recollections, it becomes possible to learn how Admiralty/MoD policy took shape on the shop floor and how knowledge, management decision making and masculine culture interacted with that policy. This information can then be juxtaposed with the reports, commentaries and views of the policy makers and critics, allowing a more realistic reconstruction, as advocated by Thompson.⁶⁷ The detail and perspective offered by personal testimonies is rarely found in documentary evidence. It enables a greater sense of empathy with the workers and gives a sense of reality to the story of the Dockyard that cannot be fully appreciated when looking solely at official correspondence and reports.

Photographic sources were also utilised extensively. As well as assisting with the visual reconstruction of the past through images of workers at their tasks and for demonstrating the risks that were present, photographs were also an excellent medium for understanding the Dockyard’s culture. Jordanova refers to photographs as ‘rich sources for historical research and writing’ but as it can be powerful and persuasive, photography is ‘at once an alluring and also a dangerous historical source’.⁶⁸ She details the problems with reliability of photographs, which reflect those of the other sources used in historical analysis, i.e. it is often the case that they are taken and indeed staged in order to elicit a particular response, such as press photographs and propaganda images. Like with all

⁶⁵ P. Thompson ‘The voice of the past: Oral history’ R. Perks and A. Thomson (eds) *The Oral History Reader* (London: Routledge, 1998), p24.

⁶⁶ R.J. Grele ‘Movement without aim: Methodological and theoretical problems in oral history’ Perks and Thomson (eds) *The Oral History Reader*, p41.

⁶⁷ Thompson ‘The voice of the past: Oral history’, p24.

⁶⁸ L. Jordanova *The Look of the Past: Visual Material Evidence in Historical Practice* (Cambridge: CUP, 2012), p130 & 132.

sources, photographs need to be interrogated and used self-consciously in order for them to live up to their 'enormous potential for thinking about the past'.⁶⁹

Quantitative sources enabled a broader view of the impact of occupational hazards. For example, the statistics compiled by Harries to analyse the impact of asbestos-related disease among Dockyard workers (see chapter 5). Such data was helpful in that it enabled comparative analysis where this was required. As well as statistics and trends from external sources, the study also used data collected from questionnaires completed by former Dockyard workers and which included a number of questions that required short answers in order that I could make 'generalizations with a degree of confidence'.⁷⁰ As with the qualitative sources (documents, life history, etc) utilised, the problems of reliability were kept in mind. Lummis identified that '... even 'hard' contemporary statistical data is only what somebody told somebody and if they have good reason and the opportunity to conceal the truth, then the 'facts' will be erroneous'.⁷¹ Again, the combination of official records with individual testimony, contemporary accounts with retrospective recollection and quantitative data with qualitative information was intended to achieve authenticity or 'the best account that it is possible to achieve by self-conscious methodology'.⁷²

A wide cross-section of participants from both genders and from many different job types and periods of employment was sought, as can be seen from the list of participants at Appendix 1. This gave a rounded view of masculine culture, of attitudes to health and safety and of the types of hazards facing workers. Two dedicated questionnaires were also devised to cover the asbestos and ionizing radiation risks and these were sent to individuals already involved in the study and who had mentioned work with asbestos and/or nuclear submarines in their interviews or initial questionnaires. Further contacts were also made via word of mouth.

Participants were sought using different methods. Some were met in person through the Chatham Dockyard Historical Society (CDHS) and Chatham Historic Dockyard Trust (CHDT) and others were contacted through reunions held in the Historic

⁶⁹ Jordanova *The Look of the Past*, p132.

⁷⁰ V. Raleigh Yow *Recording Oral History: A Practical Guide for Social Scientists* (California: Sage Publications, 1994), p6.

⁷¹ T. Lummis *Listening to History: The Authenticity of Oral Evidence* (London: Hutchinson, 1987), p75.

⁷² Lummis *Listening to History*, p15.

Dockyard and by independent groups. All of the individuals contacted in these ways were interested in maintaining links with their past employment and many were keen to share their experiences. Some respondents were located after running a search by employer on the social media site Friends Reunited.⁷³ Local newspapers and radio were also used to try and reach participants, but this was less successful. Further participants were found through word of mouth and this was a particularly successful means of locating people, as those contacted seemed to take comfort from the fact that friends or former colleagues had also taken part. A website was created for the study and generated some interest.⁷⁴ By using a variety of methods to contact potential respondents, people with varying attitudes to the Dockyard were recruited to the study. These included people who spent their entire working lives in the Dockyard until they retired, those whose life was severely impacted by the closure and others who left the region and started new lives elsewhere. It was known that some former workers still resented the closure and some refused to set foot in the Historic Dockyard, either through bitter feelings engendered by the loss of their livelihood or because they believed it no longer represented the workplace of which they had been part. Some participants highlighted these sentiments in their responses, but it was acknowledged that many who were so disposed would simply fail to take part. This attitude in itself reveals the culture of the Dockyard and the attachment that many workers felt towards it.

In contrast to projects that involve workers from private industry, former employees of the Dockyards remain subject to the Official Secrets Act. The fear of breaching this legislation precluded some from taking part, even though the questions asked in the interviews and questionnaires did not seek information that would breach the current Act. Indeed, no information concerning the design or operation of vessels or weapons systems or any other items defined as ‘defence’ by the Act, was provided by respondents that had not previously been in the public domain in secondary sources or documents released to the RDL and TNA.⁷⁵

⁷³ www.friendsreunited.co.uk

⁷⁴ www.chathamdockyard.net

⁷⁵ The full text of the current Official Secrets Act 1989 can be found at <http://www.legislation.gov.uk/ukpga/1989/6/section/2>. The Official Secrets Act 1911 to 1939 was in place during the period of this study and can be found in its constituent parts at <http://www.opsi.gov.uk>.

A total of five discussion groups were held, consisting of between two and six former workers. The groups were mixed, each with individuals of different ages and from different trades/careers. Discussion between individuals helped to draw out different opinions and experiences for the same events plus the interaction between the members in itself proved (in some cases) indicative of the hierarchical and competitive nature of the Dockyard described in questionnaires and secondary sources.⁷⁶ For example, in one group, Norman Gifford, former shipwright apprentice, commented that the shipwright was the cream of trades, to which his former colleague, Ron Harfleet, replied 'what's cream today is cheese tomorrow'.⁷⁷ The discussions were developed around a standard opening question relating to the culture of the Dockyard and a checklist of subjects to be covered, this gave them a loose structure, which was necessary to keep the discussion flowing yet relevant. Each discussion then evolved in its own way and this facilitated the introduction of new perspectives on the same topics. One issue raised by every group was that of working conditions. While some groups described them as bad and protective measures as wanting, others said that regulations, equipment and clothing were available but that precautions were not enforced. In contrast to the group discussions, the individual interviews were more in-depth but also loosely structured. As well as minimizing the impact of interviewer subjectivity on the interview, this also reflected the variety in respondents' trade/job and period of service. A checklist was used to ensure that certain key subjects were covered and this also helped where the conversation was stilted or when it flowed too freely. Discussion groups and individual interviews were audio taped. Transcription of recordings was verbatim, although no conscious effort was made to preserve local dialect and all but obviously meaningful pauses were omitted. The oral history element of this study was intended to investigate events as they were perceived by those interviewed - it is not a folklore thesis and therefore analysis of accent/speech patterns or underlying meaning in participants' answers was largely irrelevant.

Questionnaires were utilised in order to gain a greater number of responses in the timeframe and also to enable quantification of some material. The initial questionnaire covered a number of subject areas, including technological change, employment of women

⁷⁶ See especially M. Waters *The Dockyardmen Speak Out: Petition and Tradition in Chatham Dockyard, 1860-1906*; N. Casey *Class Rule: The Hegemonic Role of the Royal Dockyard Schools, 1840-1914* and P. MacDougall *The Changing Nature of the Dockyard Dispute, 1790-1840* all in Lunn and Day *History of Work & Labour Relations in the Royal Dockyards*.

⁷⁷ G2003/3 2 December 2003.

and ethnic minorities, culture, politics and closure. Where quantitative analysis was required questions with prescribed answers, such as YES or NO, were included. Elsewhere open ended responses were encouraged and a final space was included for independent comments, which a lot of respondents used. The questionnaire included questions about working conditions and responses to these provided highly relevant information about the working environment and attitudes to health and safety. Responses provided examples of victims of occupational injury and disease, nicknames, practical jokes and risk taking. A total of 53 completed questionnaires were received from former workers. Seven asbestos questionnaires and 11 radiation questionnaires were also received. This is by no means a representative sample and as such no effort was made to analyse the study population. Instead the testimony collected was used to assist in arriving at hypotheses drawn from documentary research, other life history and secondary sources.

Documentary evidence was sourced from several places. TNA is home to much of the later Admiralty and MoD (Navy) material. As well as general background information, the Admiralty files (ADM) provided information on the asbestos hazard; an example of an industrial accident that resulted in death; and an example of a worker exposed to excess amounts of radiation. Ministry of Defence (DEFE), Ministry of Pensions and National Insurance (PIN), Ministry of Labour (LAB), Treasury (TS) and Civil Service Department (BA) files were also accessed. Two submissions were made to open documents still subject to closure periods. PIN 15/4485: *Claims arising from mesothelioma and asbestosis* was opened with personal information redacted, leaving very little useful information for review. It was clear from what remained, however, that there were no cases of dockyard workers on the file. DEF 19/224 *Incidents or accidents involving MOD nuclear materials or nuclear facilities* was also petitioned open, but only contained details of one incident involving a Dockyard, which concerned the loss of a radioactive isotope at Rosyth. Very few personnel files exist for Chatham Dockyard workers owing to the destruction of records when the Dockyard closed. Radiation records were kept for former classified workers, but these are not publicly accessible.

The Royal Dockyard Library (RDL) contains an eclectic mix of information, some inherited when the CHDT took over the dockyard site in April 1984 and some donated. Useful sources included Hurt Books (records of injuries sustained in the Dockyards); accident photographs; apprentice record cards; Admiralty and MoD regulations; Chatham

Dockyard Whitley Committee minutes; pamphlets, posters and notices regarding safe working; lock logs; a full collection of the Dockyard newspaper *Periscope*; inquiry reports; and miscellaneous ephemera, newspaper cuttings, etc. An additional benefit was the presence of former Dockyard workers, who were often eager to explain technical information in layman's terms.

The RDL also holds an extensive collection of photographs, many taken by the Dockyard's photographers for *Periscope*. Images have been used to illustrate points made in the text and also to validate statements made in questionnaire responses and interviews. A box of uncatalogued photographs, which had been taken as evidence of occupational accidents and to support accident prevention lectures, was very helpful in terms of visualising risks, examples of safety signage and also the efforts of health and safety representatives to educate workers about hazards. These also correlated with a collection of overhead projector slides held by the CDHS Film Archive, which supports accounts stating that educational lectures were given to workers. In both cases, the accompanying documentation had become separated and lost.

The Dockyard newspaper *Periscope* was a useful source for all aspects of the study. The newspaper was set up by the Admiralty in its drive to be seen as a forward thinking employer and also in an attempt to increase efficiency and productivity through improved worker morale. It was also used to communicate key management messages, despite claims in its first issue that the newspaper was not a tool for management propaganda. *Periscope* was the first official Dockyard newspaper and was published from October 1965 until June 1983. The concept was subsequently rolled out to Portsmouth, Devonport and Rosyth. In Chatham it had a known readership of approximately 40-45% of the workforce. The newspaper was professionally produced and carried articles written by the editorial staff, management and dockyard workers. It was, however, a late arrival compared to the newspapers and magazines of other organisations: the Post Office, the Prudential, Boots, Lever Brothers, Rowntrees and the Great Western Railway all had staff magazines prior to 1939, with some having been produced from the late 1800s.⁷⁸ *Periscope* included articles that encouraged workers to embrace forthcoming changes, particularly in the early issues, as well as praise for jobs well done, news of ships refitted at Chatham, examination results

⁷⁸ M. Esbester 'Organizing work: Company magazines and the discipline of safety' *Management & Organizational History* 3:3-4 (2008), p219.

and long service awards, all of which helped to foster pride, loyalty and competition. Staff contributed poetry, social news and photographs. The newspaper had its own photographer and cartoonist. It was also clearly expected that workers would take the newspaper home, as it contained colouring pages and competitions for children and fashion, recipes, knitting patterns, etc., aimed at wives and female workers. Esbester observed that the company magazine was developed to address the problems of large-scale enterprises, including the separation of employees by vast physical distances and by management hierarchy; that they create an 'imagined community'.⁷⁹ Heller referred to organisations' need for a core of skilled workers who were loyal, motivated and would acquiesce to managerial decisions.⁸⁰ By the time *Periscope* was introduced there was already a well-established community in the Dockyard, but efforts to improve worker morale had been on-going since Sandys' defence cuts in 1957 began to be felt in the Dockyards.⁸¹ The newspaper was designed to bring workers closer together through articles concerning different trades. Later issues also created a community of all of the home dockyards, by including news from each of them and that which concerned all of them, as well as fostering links between the workers and the vessels that they maintained, by printing messages of thanks from the crews and also by publishing news of ships that were on operation. Health and safety articles appeared from quite early on and there were items encouraging the use of protective equipment, including eye and ear protection. While this indicates that attempts were made to educate the workforce, it cannot be assumed that everyone who subscribed to the newspaper read those items or that those who did fully comprehended the meanings inscribed by the authors of the articles.⁸² Indeed, this type of information could be likened to the technical safety advice provided to people who resided near chemical plants in Britain in the 1980s and 1990s. Subsequent surveys found that the majority of recipients of the pamphlets had not read, remembered or understood the information, potentially leading them to make decisions detrimental to their health and safety in the event of an emergency. Irwin argues that this

⁷⁹ Esbester 'Organizing work: Company magazines and the discipline of safety', p219.

⁸⁰ M. Heller 'Company Magazines 1880-1940: An Overview' *Management & Organizational History* 3:3-4 (2008), p184.

⁸¹ See E. Haxhaj 'More Bang for a Bob: the decision to 'go nuclear' and its impact on Chatham Dockyard' *Mariner's Mirror* 91 (November 2005).

⁸² See Esbester 'Organizing work: Company magazines and the discipline of safety'.

'seems to reinforce the notion of public indifference to technical advice'.⁸³ Once the Nuclear Complex was in operation, there were regular updates on refits and photographs showing nuclear submarines (SSNs) in the Dockyard.

Documents from the Turner & Newall (T&N) Archive provided an unusual insight into the relationship between the Dockyards and their suppliers.⁸⁴ The archive largely consists of material that would not usually enter the public domain and which showed the dedication of the MoD to seeking alternatives to asbestos products, despite resistance from workers in the Dockyards and pressure from T&N. At the same time, it revealed that although alternatives were being sought, the Admiralty contracts were honoured until their expiry and supplies of Admiralty grade asbestos cloth were all bought up by the MoD.

Hansard was used as a source of evidence from Parliamentary debates relating to health and safety issues, including asbestos, radiation and major accidents. It was accessed online,⁸⁵ with hard copies viewed at the Guildhall Library, London and Institute of Historical Research Library, London. Contact was also made with the House of Lords and House of Commons libraries to locate correspondence and reports referred to in debates and written answers, with varying success. One of the most frustrating problems encountered during the research for this study was the elusive nature of the nuclear incident reports for Chatham Dockyard, which seem to have been released into the public domain, but which could not be located in the House of Commons Library.

Industrial Whitley Committee minutes were used to research health and safety issues in the Dockyard, though the amount of relevant material was limited. Indeed, the lack of comment about occupational hazards and unsafe practices may in itself be indicative of the attitudes towards the risks in the Dockyard. Examples of some of the issues raised include: the future of the Dockyard; workforce reduction; wage and allowance issues; charitable collections; issues regarding comfort and convenience, such as the installation of postage stamp machines in the Dockyard, the proposed closure of one canteen making it difficult for workers to get small change and problems caused by the mud and cement dust dropped from contractors' lorries on Khyber Road (admittedly a

⁸³ A. Irwin *Citizen Science: A Study of People, Expertise and Sustainable Development* (London: Routledge, 1995), p26.

⁸⁴ The T&N Archive was accessed at Manchester Metropolitan University, but is now held privately by Geoffrey Tweedale.

⁸⁵ <http://hansard.millbanksystems.com/>

potential hazard to traffic was raised here). Incomplete collections of Whitley Committee minutes are held by both the RDL and TNA.

Local and national newspapers were used to find examples of workers impacted by industrial accident or disease. High profile accidents, such as the loss of HMS *Truculent*, received national and local press coverage. In the late 1990s, local papers commented on cancer among former radiation workers and also on victims of ARD, as the asbestos legacy began to be realised. While cases of radiation-induced cancer are rarely published in the newspapers today, asbestos is still a very current topic. In 2012, Medway was revealed as having the second highest rate of mesothelioma in England and Wales.⁸⁶

Evidence derived from these various sources underpins the findings of the principal chapters of this thesis. Dedicated literature reviews covering the subjects of subsequent chapters are provided within those chapters. Despite the publication of new works since Lunn and Day's call for more detailed research on the shipbuilding and repair industry from the point of view of the Dockyards,⁸⁷ a gap in knowledge concerning the post-1945 period persists. This is particularly true when it comes to health and safety and masculine culture. This thesis contributes to the discourse on the Dockyards, through an analysis of the factors that contributed to industrial accidents and disease among workers at Chatham Dockyard in the post-1945 period. During this study some of the participants have sadly died; their passing reinforces the knowledge that the experience of working in the Dockyard will cease to be a living memory within a relatively short time. This study therefore makes an important contribution to the collection of testimony from surviving Dockyard workers, before that ceases to be possible.

Each substantive chapter of the thesis contributes to specific historiographical areas. Chapter 2 highlights the social, political and economic issues that influenced policy and management decisions in the period. It brings together research from other historians with empirical data to establish a brief history of Chatham Dockyard from 1945 to 1984. It emphasises the uncertainty of this period in the Dockyard's history combined with the occurrence of significant social change. The chapter also sets out the applicable health and safety legislation and establishes through documentary evidence that while the Dockyard

⁸⁶ *Kent Online* 16 February 2012
<http://www.kentonline.co.uk/kentonline/news/2012/february/16/asbestos.aspx>.

⁸⁷ Lunn and Day *History of Work & Labour in the Royal Dockyards*, p xiii.

was immune from prosecution, a visit from the Factory Inspector remained an unwelcome prospect. Chapter 3 draws heavily on empirical evidence to provide a unique historical account of working conditions in Chatham Dockyard from 1945 to 1984, hitherto absent from the historiography of the Dockyards. Its use of testimony is an important contribution to the life history of the Dockyard, with particular regard to working conditions and occupational hazards, while the analysis of major accidents, using inquiry reports and testimony, provides extreme examples of the impact of behavioural issues on workplace safety. Chapter 4 is an unprecedented consideration of masculine culture in Chatham Dockyard. It uses testimony, *Periscope* and documentary evidence to demonstrate the existence of masculine culture and to assess how it impacted on worker safety. Again, it contributes significantly to the life history of the Dockyard. Also, in considering the manifestation of masculine culture in the Dockyard, the study addresses the lack of writing on women working in traditionally male dominated professions in this period and the difficulties that faced them. Assessment of the asbestos and ionizing radiation risks have hitherto been absent from the historiography of the Dockyards. Chapters 5 and 6 provide an understanding of the manifestation of these major hazards in the Dockyards, the impact on workers and how they were managed. They also include testimony from former workers, which further contributes to the life history of the Dockyard and of these two subjects. Chapter 5 builds on the work of Tweedale and of Johnston and McIvor in terms of the asbestos risk, while chapter 6 introduces a new discussion in terms of the impact of ionizing radiation on industrial workers outside of the nuclear power industry. Together, these chapters achieve the overall aim of the thesis, which is to contribute to the discourse on the history of health safety and in doing so, to open up a new discourse on health and safety in the Dockyards during the post-1945 period.

Chapter 2

Historical and Legislative Background

The overarching theme between 1945 and the Dockyard's closure on 31 March 1984, was reduction in work and workforce. As table 2.2 shows, six British Dockyards closed in the period, including the base at Chatham. The table also shows that at its peak, Chatham Dockyard employed circa 14,500 people and that by 1980 less than half that figure was employed. This reflects changes in technology making some tasks less laborious, but also political and economic changes that contributed to the reduction of the Fleet and its support network. With the Cold War and nuclear arms race dictating defence policy for much of the period, the budget for conventional weapons and the naval Fleet contracted. The Royal Dockyards had to fight for survival as shore support was progressively reduced. The aim of this section is to provide a political, social and economic backdrop to the history of health and safety at Chatham Dockyard, which is essential in order to understand the actions of both the Navy and the workforce in the period. It also provides brief historical accounts of the Dockyard School and the Medical Services, both of which contributed to health and safety education. Finally, an historical overview of the UK's health and safety legislation gives further context.

The role of the Royal Dockyards has invariably reflected the demands of state policy. While the Dockyards have always been involved in the refitting and repairing of warships, construction was contracted out to private shipbuilders as early as 1793.⁸⁸ In the 1930s, for example, this was done to provide work for struggling private shipbuilders. By 1969, following the completion of HMS *Scylla* at Devonport Dockyard, new construction of warships in the Dockyards ceased.⁸⁹ The last warship to be constructed at Chatham Dockyard was the 'O' Class submarine HMCS *Okanagan*, which entered service in the

⁸⁸ See R. Morriss, *The Royal Dockyards during the Revolutionary and Napoleonic Wars* (Leicester University Press: 1983), pp27-30.

⁸⁹ A. Lambert 'The Impact of Naval Technology on Warship Construction and Repair at Devonport, 1815-1986' M. Duffy *et al* (eds) *The New Maritime History of Devon: Volume II: From the Late Eighteenth Century to the Present Day* (London: Conway Maritime Press, 1994), pp184-5.

Canadian Navy on 22 June 1968.⁹⁰ Sir Keith Speed, Parliamentary Under Secretary for Defence (RN) from 1979 to 1981, defined the role of the Dockyards in the twentieth century as follows:

The dockyards exist first for the timely repair of the ships of the Fleet in peace and war and for the conduct of such major maintenance, e.g. routine docking and work beyond the capability of uninformed manpower, as will ensure that the need for repairs other than that stemming from war or accident is minimised. Secondly, the dockyards are used to update ships of the Fleet to meet the evolving threat and/or to take advantage of advances in technology, to build warships or auxiliary craft (but now to an increasingly limited degree) and to support local shore establishments and naval base facilities.⁹¹

The major modernisation of the submarine depot ship, HMS *Forth*, which started at Chatham in 1963, is an example of the type of work that the Dockyards undertook during the post-1945 period. The work on the vessel included improved and additional accommodation and workshops and the introduction of a complete nuclear refit facility so that she could support the Polaris fleet.

When the Second World War ended the Dockyards began a period of dramatic rundown. Lambert has shown that by 1947 the total dockyard workforce was reduced by 90%.⁹² Pembroke Dockyard also closed in that year. During the war younger and skilled dockyard workers were conscripted into the armed forces, appointed as overseers on repairs in private yards or posted to repair establishments abroad.⁹³ Women, men over the age of 60 and dilutees (tradesmen who had not had a formal apprenticeship) were taken on to replace them and consequently were among the first to lose their jobs once the war was over. From 1945 to 1948 the workforce was kept busy refitting the active Fleet and preparing some vessels for their peacetime roles.⁹⁴ The Dockyards also took on repayment work,⁹⁵ which included work on behalf of civil industries and to assist with local

⁹⁰ The nuclear test barge *MAC 1012* was the last craft to be constructed by the Dockyard and was launched on 10 February 1971.

⁹¹ J. Fisher *The Medway Disaster: A Report produced for T.G.W.U. Region No 1* (University of Surrey: 1981), p10.

⁹² A. Lambert, 'Impact of Naval Technology', p.184.

⁹³ D.K. Brown *A Century of Naval Construction: The History of the Royal Corps of Naval Constructors* (London: Conway Maritime Press, 1983), p.284.

⁹⁴ Brown, *Century of Naval Construction*, p294.

⁹⁵ TNA, PREM 8/759: Future policy for the Royal Dockyards. Statement on the future of Rosyth as a Naval dockyard in peace-time, 1945-8.

community post-war rebuilding programmes. It had long been the practice for the Dockyards to undertake work on repayment terms for other Exchequer Departments, Commonwealth Governments and a small amount of work for private individuals.⁹⁶ Chatham Dockyard manufactured cement mixers for Winget, Rochester; experimental diesel engines for Halls of Dartford; and cigarette making machines for Molins, Deptford. Some 5,000 workers were employed directly on purely non-naval work by 1947.⁹⁷ Such work was rarely profitable, however, due to high production costs, bad communication and differing civilian and Admiralty methods.⁹⁸ For example, in Portsmouth Dockyard, three orders for work on excavators and cranes for Messrs Stothert and Pitt were completed with losses of £1,559, £1,672 and £1,178 respectively.⁹⁹ Advances during the war meant that many ships in the British Fleet were rendered obsolete, including those that had only recently been completed. These vessels were among those that entered the Dockyards for redevelopment in the post-War period. Other classes were cancelled before they reached the slips or in some cases while they were still on them. The vessels built and cancellations at Chatham in the period are shown in table 2.1.

According to Lambert, the Navy spent a great amount of money between 1950 and 1960 in order to keep abreast of technological development ‘so rapid that ships in hand were redesigned while rebuilding, or were rebuilt more than once’.¹⁰⁰ In the midst of this spree, ‘The Way Ahead Committee’ was established by the Admiralty with Lord Mountbatten at the helm.¹⁰¹ Mountbatten was determined that cuts would not impact the active fleet and so the Committee’s attention was directed at the Navy’s structure and supporting organisation. Its recommendation to reduce shore support expenditure had severe implications for the Medway Towns. The abolition of the Nore Command and closure of the Royal Marine Barracks there effectively meant the exit of the Navy from the area and

⁹⁶ TNA, Command Paper No 114: Accounts of Shipbuilding and Ship Repairing in HM Dockyards and by Contract, Session 1947-48, p4. (Microfiche)

⁹⁷ House of Commons Debates, 18 March 1947, col. 212. Mr John Dugdale, parliamentary and financial secretary to the Board of Admiralty speaking on Supply: Navy Estimates.

⁹⁸ TNA, ADM 116/5828: GF 346/50, 3 August 1950.

⁹⁹ National Archives, Admiralty and Secretariat Papers ADM 116/5828: GF 346/50 dated 3rd August 1950.

¹⁰⁰ A. Lambert, ‘Impact of Naval Technology’, p185.

¹⁰¹ TNA, ADM 1/26068: ‘Where are we going’ Board memorandum B983: review of future naval policy, 1955.

this was compounded by the closure of Sheerness Dockyard.¹⁰² Capper's history of the Nore Command includes his own recollection of the Dockyard after the Navy had left:

The Yard [Chatham Dockyard] gives the impression ... of being a shadow of itself. The clangour and the clashing, the rattling of cranes, and the hurtling of antiquated locomotives that used to assail the ears of one small boy at least, now seem almost wrapped in a Sabbatarian hush ...¹⁰³

Just as the Second World War increased the use of asbestos in the Naval Fleet and thus the risk to workers' health, so the construction and refitting of the nuclear powered submarines of the Cold War period also impacted on the safety of both service personnel and the civilian workforce. In the wake of the Suez Crisis and its revelation of the limits of the so-called 'special relationship' with the US, Britain began to develop an independent nuclear deterrent in a desperate attempt to demonstrate that it was still a world power.¹⁰⁴ Duncan Sandys' 1957 Defence Review saw funds directed towards this enterprise; firstly the V-bombers, with their free-fall nuclear weapons,¹⁰⁵ were to be replaced as the main deterrent with the land-based, long-range ballistic missile system *Blue Streak*. At the same time, emphasis was placed on the reduction of spending on conventional forces for the five years to 1961. Consequently, conventional warfare and thus the Navy were seemingly superseded for any but 'peacetime emergencies and limited hostilities', while the Air Force controlled both the V-bombers and *Blue Streak*.¹⁰⁶

Consequently, cuts, reviews and efficiency measures continued to impact the Navy. In the late 1950s, Chatham was embroiled in the debate regarding the planned closure of Malta Dockyard. As the Admiralty's only other viable option for closure, Chatham's future came into question. The planned closure of Sheerness Dockyard worked in Chatham's favour, as if it were also to close, the redundancy of some 8,000 established workers from both yards would result within an extremely short period. Moreover, the naval fleet based

¹⁰² Sheerness Dockyard was located approximately five miles along the River Medway from Chatham Dockyard.

¹⁰³ D.P. Capper, *Moat Defensive: A History of the Waters of the Nore Command 55BC to 1961* (London, 1963), p233.

¹⁰⁴ For more on Britain's status and diplomacy in the period, see D. Reynolds *Britannia Overruled: British Policy and World Power in the 20th Century* (London: Longman, 1991) and R. Holland *The Pursuit of Greatness* (London: Fontana Press, 1991).

¹⁰⁵ Capt. J. E. Moore (ed) *The Impact of Polaris: The origins of Britain's seaborne nuclear deterrent* (Huddersfield: Richard Netherwood Limited, 1999), p13.

¹⁰⁶ E. Haxhaj, 'More Bang for a Bob: The Decision to 'Go Nuclear' and its Impact on Chatham Dockyard' *Mariner's Mirror*, 91 (2005), p555.

in the Mediterranean was much reduced and this introduced an element of redundancy to overseas Dockyards and naval bases, particularly Malta.

Another priority for the Admiralty at that time was the reorganisation of the management of the Dockyards. This involved cuts in manpower at the Dockyards and Director of Dockyards, Rear Admiral Pelly, believed that the support of the workers and of the Trade Unions would be harder to secure if Chatham were closed.¹⁰⁷ It was already foreseen that the closure of Sheerness would adversely affect the proposals, but to close Chatham as well would seriously damage industrial relations. Ultimately, Chatham was saved by the fact that a private concern was willing to buy Malta and this was formally announced in Parliament on 18 February 1958, along with the intention to close Sheerness, Portland, Singapore and Gibraltar Dockyards.¹⁰⁸ Malta Dockyard was taken over by Messrs. Bailey (Malta) Ltd on 30 March 1959.¹⁰⁹

The re-organisation programme commenced in 1959, following a Manager's Conference held at Sundridge Park and Chatham Dockyard became the pilot yard. The aim was to improve efficiency and if the pilot was successful the new structure, which mimicked that of the US Navy Yards, would be rolled out to the other Dockyards. As has been shown, maintenance of worker morale was considered essential to ensure the full co-operation of workers and so all rumours of closure or rundown at Chatham were denied. Chatham Dockyard's Admiral Superintendent, Rear Admiral J Y Thompson, stated 'it should be clear from the work and re-organisation programmes that the Yard will continue'.¹¹⁰ The local press also carried positive reports:

All uncertainty about the future of Chatham Dockyard, which has 13,000 people on its payroll, ended yesterday (Monday) when it was officially announced that Chatham has been selected as "pilot" yard for a scheme for the major reorganisation of all Royal Dockyards.¹¹¹

¹⁰⁷ TNA, ADM 1/27493: Director of Dockyard's Report *The Case For Chatham* 1957.

¹⁰⁸ ADM 1/27493.

¹⁰⁹ TNA, ADM 1/27497: HM Dockyard Malta Transfer to Messrs. Bailey (Malta) Ltd, Papers to Ministers. Cabinet Minute 9 April 1959.

¹¹⁰ RDL, Minutes of the 176th Meeting of the Chatham Yard Industrial Whitley Committee held on Thursday, 8 January 1959.

¹¹¹ *Chatham Standard* Tuesday 24 February 1959, 'Chatham is Selected as 'Pilot' Yard', pp1&8.

Eight months later and the assertions continued with First Lord of the Admiralty, Lord Selkirk's statement to the press:

I would like to say categorically that the future of Chatham Dockyard is as assured now as it has ever been. This has been clearly stated in Parliament on several occasions by myself and the Civil Lord.¹¹²

Selkirk's carefully worded statement would mean nothing to anyone who had witnessed the debate over Chatham's closure in the previous two years or who recognised that the Dockyard had faced closure a number of times throughout its long history. As early as 1810, the problem of silting in the River Medway instigated talk of its closure. Again in 1906, with the launch of the revolutionary battleship HMS *Dreadnought*, Chatham Dockyard was rendered too small for the future construction of battleships. In 1905 HMS *Africa* was the last surface battleship to be constructed there, she was also the largest at 16,350 tons. Salvation came in the construction of *C17* in 1908, the first submarine to be built in a Royal Dockyard. Chatham quickly became the Navy's submarine specialist and built a total of 57 submarines (see table 2.3). Of these, just eight were built between 1945 and 1968, three of which were for the Royal Canadian Navy (RCN).

In 1963 it was announced that the Dockyard's manpower was to be reduced by some 500 in order to redress an imbalance between trades. It was stated that this could be overcome by normal wastage, the adjustment of overtime, a fall in the number of men employed over the age of 65 and restriction of adult entry.¹¹³ The local press, however, reported that redundancies were afoot, with one in 22 jobs to be axed.¹¹⁴ Work on HMS *Forth* was expected to require additional manpower from 1964/65 and so the final decision on numbers was deferred until 1965. By this time, the Dockyard had begun to lose experienced and skilled craftsmen to private industry where wages were much higher. Pay disputes were also a feature of the period and while less militant than their colleagues in Rosyth¹¹⁵, Chatham workers employed such tactics as refusing to work shifts and overtime in order to gain better rates. As is shown in chapter 6, these methods and refusal to

¹¹² TNA, ADM 1/27493: Extract from *Chatham Observer* 2 October 1959.

¹¹³ RDL, Minutes of the 194th Meeting of the Chatham Yard Industrial Whitley Committee held on Wednesday, 12 June 1963.

¹¹⁴ *Chatham, Rochester and Gillingham News* 17 May 1963, p1 and back page.

¹¹⁵ See A. Law 'Neither Colonial nor Historic: Workers' Organization at Rosyth Dockyard, 1945-95' Lunn and Day (eds) *History of Work & Labour in the Royal Dockyards*, pp151-178.

volunteer for work in reactor compartments became very effective when the nuclear refit schedule was at stake.

Blue Streak ultimately proved to be vulnerable to Soviet attack, while advances in technology meant solid fuelled missiles with better navigational accuracy became available and so the project was cancelled in 1960. Initially it was to be replaced by Skybolt missiles procured from the US and paired to the V-bombers, but increasing costs and a slipping in-service deadline rendered the project a non-starter.¹¹⁶ In 1963 Britain procured US manufactured Polaris submarine launched ballistic missiles and the Navy became custodian of the nuclear deterrent. A fleet of nuclear-powered submarines was constructed to launch the missiles (referred to as the SSBNs). Despite its submarine expertise, Chatham was denied a contract for building one of these submarines. Economics and safety were the main arguments cited by the Admiralty. The narrow and silted approaches to the slipways at Chatham via the River Medway were not considered safe for maneuvering large nuclear submarines. The proximity of the local civilian population also affected the decision.¹¹⁷ The last of four 'O' Class submarines, HMS *Onyx*, was laid down at Chatham Dockyard on 27 September 1962, but prior to her completion the vessel was transferred to the RCN and renamed HMCS *Ojibwa*.¹¹⁸ With no new construction planned to follow this vessel, rumours concerning the future of the Dockyard began to circulate again. Some respite came in the form of two further 'O' Class submarines ordered by the Canadian Navy. There had been some deliberation about whether the Dockyards should be allowed to tender for this type of work, but, fortunately for Chatham, the private yards were all too busy to take it on.¹¹⁹

In 1965, a year before the name ship of the *Resolution* Class nuclear submarines was launched at Vickers, the Controller and Fourth Sea Lord refuted the arguments of the Admiralty Board against using Chatham Dockyard for work on nuclear submarines. He

¹¹⁶ For more on the development of the British nuclear deterrent, see L. Freedman *Britain and Nuclear Weapons* (London: The MacMillan Press Ltd, 1980); Grove *Vanguard to Trident*; Moore (ed) *The Impact of Polaris*; P. Nailor *The Nassau Connection: The Organisation and Management of the British Polaris Project* (London: HMSO, 1988).

¹¹⁷ TNA, ADM 1/28574.

¹¹⁸ The HMS *Onyx* that was finally commissioned into the Royal Navy was completed by private shipbuilders: Cammell Laird.

¹¹⁹ See E. Haxhaj, 'More Bang for a Bob: The Decision to 'Go Nuclear' and its Impact on Chatham Dockyard' *Mariner's Mirror*, 91 (2005).

was motivated by the reality that, by 1969, additional refitting and refuelling capacity would be needed for the nuclear powered fleet submarines (the SSNs). Rosyth Dockyard continued to refit and refuel the SSBNs, but did not have enough capacity to take on the SSNs too. Consequently, the hazards of moving nuclear submarines along the Medway were thrown out as over cautious, as were the concerns for the local civilian population. The somewhat spurious justification proffered was that the Royal Naval Barracks had mistakenly been included in the initial investigation; as civilians did not occupy them, they were discounted the second time around.¹²⁰ The Nuclear Complex at Chatham Dockyard was opened in 1968 by Admiral Sir Horace Law. Hope for the Dockyard's future was restored, but at the same time a significant increase in the radiation risk to workers was also introduced.

Among the workers in the Nuclear Complex was Chatham's first female apprentice, Zandra Bradley, who was indentured in 1971. The earliest record of women working in the Dockyards is from 1803, when Commissioner Hope at Chatham Dockyard, wrote to the Navy Board to propose taking six women on to assist the tailor in making colours.¹²¹ This appointment and that of women to the Ropery in the late nineteenth century were responses to shortages in workforce. Women were employed more widely across the Dockyard during the First World War, including in the boiler shop, fitting shop and naval stores. By November 1918 1,577 women held jobs in the Dockyard, though once the War ended, this number reduced significantly.¹²² Women also took on various roles during the Second World War and it seems their efforts were generally thought of highly by the men who worked with them. Michael Conway, shipwright from 1952 to 1963, recalled:

I remember some of the shipwrights who had worked in the Boathouse during the 2nd World War praising the work of the women and how skilfull they had been.¹²³

Peter Dawson, patternmaker apprentice from 1941 to 1948, recalled that appointment of women during this period influenced a general improvement in welfare.¹²⁴ It was not until

¹²⁰TNA, ADM 1/29069: Report on considerations involved in selection of yards to refit nuclear submarines, 1963-4.

¹²¹ J. Ryan *Women Naval Dockyard Workers in two 19th Century Dockyard Towns: Chatham and Plymouth* (University of Greenwich, 2011), p50.

¹²² Ashby "*Ladies*" of the *Colour Loft and Ropery Women*, pp15 & 42.

¹²³ Questionnaire 180.

the 1970s, however, that women began to take on apprenticeships and to be appointed in their own right to industrial roles.¹²⁵ The first female industrial workers at Chatham Dockyard included: first female sail maker, Celia Boorman (1976); first female drivers, Eileen Smith, Geraldine Willis, Janette Cowie and Ann Ratcliffe (1977); and first female slingers, Rita Spinks and Val Rydale (1977). The Dockyard also appointed a woman police constable, Jeanette Carrick, in 1976.¹²⁶ From the late 1970s, women also began to be appointed as ships' cleaners. One of the first was Jackie Brown, who was photographed in her overalls as Maid of the Month in August 1977. Brown was attracted to the job for the money, having left a job as an assembler in a factory that paid £25 per week, to earn £52 per week before overtime as a ships' cleaner in the Dockyard. In one week she earned £111 on shift work aboard the nuclear submarine HMS *Conqueror*. Foreman of the Yard, Des Brown, commented 'Although it is predominantly a man's job, we now employ 10 per cent women on ship cleaning and the youngsters are proving to be just as good as the men'.¹²⁷

The relevance of these appointments to this study lies in the impact they had on the masculine culture of the Dockyard. As Bartram and Shobrook found, the employment of women in such roles accentuated rather than suppressed dominant masculine social practices, which are considered in later chapters for their role in the acceptance of dangerous work and their influence on unsafe working practices.¹²⁸ This aspect of the Dockyard's history is dealt with in more detail in Chapter 4.

In 1980 Chatham Dockyard received further assurances about its future. The Dockyard Personnel Department was sure enough to promise secure jobs and advertise vacancies at Gillingham Football Ground (see figure 2.2).¹²⁹ A photograph of the hoarding was published in the September 1979 edition of *Periscope*, with the following caption:

¹²⁴ Questionnaire 158.

¹²⁵ The first known female dockyard apprentice was Mary Lacy. Indentured at Portsmouth Dockyard in 1763, she had disguised herself as a man and managed to fool the majority of those she worked with for long enough to qualify and work until early retirement through ill-health. See M. Lacy *The Female Shipwright* (London: National Maritime Museum, 2008) and S. J. Stark *Female Tars: Women Aboard Ship in the Age of Sail* (London: Pimlico, 1998).

¹²⁶ Questionnaire 44.

¹²⁷ *Periscope* August 1977, p1.

¹²⁸ R. Bartram and S. Shobrook 'You have to be twice as good to be equal: 'placing' women in Plymouth's Devonport Dockyard' *Area* 30:1 (March 1998), p63.

¹²⁹ P. MacDougall *Chatham Dockyard in Old Photographs* (Gloucestershire: Alan Sutton Publishing Limited, 1994), p118.

Hoping to score with Gillingham soccer fans and attract more skilled craftsmen to work in the Dockyard, Personnel Department's Bert Foulser, CPO I, and Kevin Isted, EO(I), have had this huge recruiting notice sited at the Third Division club's ground for the new season.¹³⁰

But the positivity was misplaced. At the beginning of the following year John Nott was appointed Secretary of State for the Ministry of Defence. Speed noted:

There was considerable speculation in the press that John Nott had been put into Defence to do a hatchet man's job that Francis Pym [Nott's predecessor] was not prepared to countenance. A few nights after his appointment, I was told by a very senior diplomat from a friendly NATO ally that this was certainly so.¹³¹

Nott's 1981 Defence Review set in train cuts that included the closure of Chatham Dockyard and three years later, after a period of intense activity during the Falklands War, Chatham Dockyard was finally closed. Nott made the following comment on the closure:

... Chatham Dockyard, redolent with great tradition and wonderful architecture, but hopelessly vulnerable to tides and access and an air attack in any conflict. The Royal Navy had wanted to close it for years, but it was not 'politically' possible – they were nearly right.¹³²

Education

The formal education of apprentices in the Royal Dockyards began before 1805, when the Barham Commission recommended that improvement in the standard of apprentices was required. Chatham Dockyard had provided evening classes on reading, writing and arithmetic for many years prior to this.¹³³ The first formal dockyard school was established at Chatham in 1843, followed by schools at Portsmouth and Devonport in 1844 and at

¹³⁰ *Periscope* September 1979, p1.

¹³¹ K. Speed *Sea Change: The Battle for the Falklands and the Future of Britain's Navy* (Bath: Ashgrove Press, 1982), p99.

¹³² J. Nott *Here Today, Gone Tomorrow: Recollections of an errant politician* (London: Politico's Publishing, 2002), p237.

¹³³ N. Casey 'Class Rule: The Hegemonic Role of the Royal Dockyard Schools, 1840-1914' in K. Lunn and A. Day (eds) *History of Work & Labour Relations in the Royal Dockyards* (London: Mansell Publishing Limited, 1999), p67. For more detail on the establishment of the schools and the dire situation with regard to apprentice education beforehand, see J. M. Haas 'The Best Investment Ever Made: The Royal Dockyard Schools, Technical Education, and the British Shipbuilding Industry, 1800-1914' *Mariner's Mirror* 76:4 (November 1990).

Sheerness, Pembroke, Deptford and Woolwich in 1846.¹³⁴ The schools provided technical and academic education for apprentices and for labourers and qualified craftsmen before this became commonplace in industry. They even influenced some aspects of what would become the British state education system.¹³⁵ Casey argues that their institution was part of the Admiralty's strategy, 'which, by encouraging employees to culturally invest in the Dockyards, aimed to secure social and industrial relations'.¹³⁶ The schools certainly encouraged the sense of exclusivity of the life inside the Dockyard walls and propagated the seeds of Dockyard culture within the young apprentices' minds.

The Dockyard Schools fostered the competitive spirit that contributed to the very masculine culture within the Dockyards.¹³⁷ As Tosh argues, 'the working man's property lay in his skill' and for the Chatham Dockyard skilled worker, this skill was acquired through apprenticeship.¹³⁸ Brown describes the principles of the schools as including 'Fierce competition, a blend of theory and practice, a gradual selection process by examination and a total absence of social distinction and nepotism.'¹³⁹ The boys that took dockyard apprenticeships were generally 'from lower-tier secondary schools, many from humble backgrounds' and the dockyard schools gave them the opportunity to 'acquire an excellent technical education'.¹⁴⁰ Indeed, the schools provided a sound education for apprentices and for those who were particularly gifted, the opportunity to study further and even proceed to university, often with a scholarship. Crawshaw records that between 1869 and 1925, 68 Chatham Dockyard apprentices secured Whitworth¹⁴¹ awards and that between 1935 and 1953 they won one Senior Whitworth Scholarship, 17 Whitworth Scholarships, 41 Whitworth Prizes and five Royal Scholarships. He also noted that from 1947 Technical State Scholarships were awarded to suitable candidates under the age of

¹³⁴ King 'The Royal Dockyard Schools and their Education System', p464.

¹³⁵ Casey, 'Class Rule', p66.

¹³⁶ Casey, 'Class Rule', p67.

¹³⁷ For more on masculinity and industry see: R. Johnston and A. McIvor, 'Dangerous Work, Hard Men and Broken Bodies: Masculinity in the Clydeside Heavy Industries' *Labour History Review*, 69 (2004), 135-51.

¹³⁸ Tosh *Manliness and Masculinities in Nineteenth Century Britain*, p37

¹⁴⁰ King 'The Royal Dockyard Schools and their Education System, p466.

¹⁴⁰ King 'The Royal Dockyard Schools and their Education System, p466.

¹⁴¹ The Whitworth Scholarship scheme was founded by Sir Joseph Whitworth in 1868 to advance the discipline of mechanical engineering.

20.¹⁴² The very best of each entry were offered entry into the Royal Corps of Naval Constructors.

In the post-1945 period, two parallel schools operated: a lower school, with a duration of three years and an upper school, which concluded after four years. Completion of the fourth year was, by 1945, regarded by the Civil Service Commission to be equivalent to a third class Honours degree.¹⁴³ Brown comments on the pride of the apprentice who managed to complete all four years:

At the end of each year more than half the apprentices were dropped from the School and in the fourth year there were often less than a dozen scholars left in each yard. With a ring of pride or envy, an apprentice would be spoken of in awe as a 'fourth year boy'. At the end of the fourth year, only the top one or two from all the Dockyard Schools would be selected for higher education and entry to College as a Naval Constructor. One or two out of the total entry of 1500 four years previously represented quite brutal competition, possibly even too brutal in some later eras.¹⁴⁴

Competition between apprentices was actively encouraged. In the schools, for example, apprentices were sat in order of the position they achieved in the entrance examination.¹⁴⁵ Competition was also nurtured through prizes and awards for achievement. Crawshaw records that these included ordinary prizes and Admiralty prizes and the Bath Memorial Prize, which was made in the memory of Mr S Bath of the Constructive Department. In 1924, Mr Thomas James Coast, Admiralty Overseer and Foreman in the Dockyard, gave £100 to the Corporation of Gillingham in order that a watch be presented to the boy who passed out highest in the list of candidates for entry as shipwright apprentices. Fourth year apprentices who attained over two-thirds of the total marks in the Midsummer Examination were allowed to keep their textbooks. In 1943, in celebration of the school's centenary, the Chatham Dockyard School Bursary Fund was established, which provided an annual grant for any ex-fourth year apprentice who went to university.¹⁴⁶ There was also competition between the Royal Dockyards with the Apprentice of the Year Competition. In 1980, the competition had two categories, one for technician apprentices and the other for craft

¹⁴² RDL, Ref: 1995.0005.03: J.D. Crawshaw, *History of Chatham Dockyard School*, p57.

¹⁴³ Brown, *Century of Naval Construction*, p33.

¹⁴⁴ Brown, *Century of Naval Construction*, p33.

¹⁴⁵ King 'The Royal Dockyard Schools and their Education System, p464.

¹⁴⁶ Crawshaw, *History of the Chatham Dockyard School*, p56.

apprentices. In a radio interview, craft apprentice nominee for Chatham Dockyard, Ian Pool, explained:

It's been changed this year, because usually it's the technician that wins because they have a better training in the management area and therefore they tend to walk the interviews.¹⁴⁷

Andrew Easdown, the Dockyard's technician apprentice nominee, was also interviewed and mentioned his desire to win the Bath Open Competition and also that he was being posted to Bath to gain design experience in November 1980. The interview also mentioned that Chatham Dockyard had a good record in terms of winning the competition. Former winners included the Dockyard's first female direct entry technician apprentice Sukhdev Panesar (see chapter 4).

Latterly, apprentices were entered for state examinations, such as City & Guilds, General Certificate of Education (GCE) Ordinary Level (from 1951) and Certificate of Secondary Education (CSE) (from 1965). Records for apprentices show GCE 'O' Level and CSE subjects taken. Qualifications earned through the Dockyards were thus recognisable by employers outside, should apprentices decide to move on. Besides the technical subjects apprentices also took subjects such as English Language, French, Geography, History and Liberal Studies.¹⁴⁸

Communication with employees and trades unions was undertaken in the Dockyards via the Whitley Committees. Although more quiescent than their civil counterparts, the Dockyards had strong trade representations, suggested by Lunn and Day to be a legacy of the import of workers from the north of England in the late nineteenth century.¹⁴⁹ The Whitley Committees were introduced across the Civil Service in 1917/18 as a response to national industrial unrest after the First World War. Named after Halifax MP, John Henry Whitley, who chaired the committee that formed them, they were a constant feature in Dockyard management from then on. They included representatives from the Navy, (the 'Official Side') and from the workforce, (the 'Trade Union Side') and met on a regular basis to discuss relevant issues. Apprentices were prepared for this system

¹⁴⁷ Taped radio interview with Chatham Dockyard nominees to the Apprentice of the Year Award 1980: Andrew Easdown and Ian Pool. The tape was supplied by Andrew Easdown.

¹⁴⁸ RDL, Apprentice Record Cards and Crawshaw, *History of the Chatham Dockyard School*, p62.

¹⁴⁹ K. Lunn and A. Day 'Continuity and Change: Labour Relations in the Royal Dockyards, 1914-50' in Lunn and Day *History of Work & Labour Relations in the Royal Dockyards*, p132.

of communication and collective bargaining via the Departmental Apprentices' Committee. This was established to discuss 'matters affecting the welfare and behaviour of apprentices and to bring to the notice of the Management any practical suggestions for improvements'.¹⁵⁰ The committees consisted of six apprentices, two group instructors and an inspector, who acted as chairman.

The School also encouraged apprentices to undertake extra-curricular activities. From 1953, the Admiralty paid for apprentices to attend the Schools of the Outward Bound Trust, including the Sea School, Aberdovey; Mountain School, Eksdale; Moray Sea School, Burghead; and Mountain School, Ullswater. Trips were also made by groups of apprentices to outside industry, though these were normally organised by the relevant department, rather than the School, so that organisations pertinent to the trade were visited.¹⁵¹

For much of this period the objective for many young boys on leaving secondary school was to find an apprenticeship. The Dockyard apprenticeships were among the most highly prized and the competition just to gain entry was high. Parents often advised their sons to apply for the Civil Service exam, believing that once you had a job in Chatham Dockyard you had a job for life and a good pension. Another persuasive factor was the high quality of the tuition. Between 1890 and 1906, a movement led by Chatham Dockyard storehouseman, William Lewington, campaigned for a new generation of schools to be built in Gillingham that would raise the standard of primary education. The ultimate aim was to provide equal opportunities for local boys in the Civil Service exam.¹⁵² From this point forward local secondary schools often tutored boys in the subjects required for the Civil Service exam and parents would often aim to send their sons to the schools that scored the most successes in the exam. The reputation of the Chatham Dockyard apprenticeship was such that some boys travelled from North Kent and the Kent coast to benefit from them. Chris Andrews, former electrical engineer, recalled moving away from home at 16 years old and staying in digs arranged for him by the Dockyard welfare officer. In addition to his apprentice's wage of 59 shillings per week, he received a lodging allowance and railway warrants:

¹⁵⁰ Crawshaw, *History of the Chatham Dockyard School*, p62.

¹⁵¹ Crawshaw, *History of the Chatham Dockyard School*, p62.

¹⁵² M. Waters 'The Dockyardmen Speak Out: Petition and Tradition in Chatham Dockyard, 1860-1906' Lunn and Day (eds) *History of Work & Labour Relations in the Royal Dockyards*, p89.

In September 1955 I found myself away from home for the first time, except of course for holidays. But now I was among total strangers ... I cannot remember the name of the lady I was staying with at the bottom of Woodlands Road, only that she seemed as old as my grandmother. She had lost her husband during the war, one of the many Merchant Navy casualties, and had been alone ever since.¹⁵³

Following a review of the education of apprentices in 1968, it was decided that technical education should be transferred to Local Education Authorities. Consequently, in 1971, the School, by this time known as the Chatham Dockyard Technical College, ceased to exist and apprentices attended the local Technical College instead.

The initial questionnaire for this study asked respondents to recall their first day at the Dockyard. The following comments from former apprentices give some idea of the daunting prospect that starting work in the Dockyard presented and also explain how an apprentice would spend his or her first day.

Thomas Harris, shipwright apprentice entered 1939. 16 years old:

A day of wonderment not knowing what to expect. However, everyone was very helpful and at the end of the day I was very happy.¹⁵⁴

George Butley, boilermaker apprentice entered in 1939, 15 years old:

It was like walking into hells kitchen (when all the smithery fires started up, filthy dirty (foul language)).¹⁵⁵

Smith Adams, shipwright apprentice entered in 1946, 16 years old:

Assembled in apprentice training centre in Old Mast House. Told do's and don'ts and what we would do in our first year. Told what day(s) individuals would be attending the Dockyard School. There were 40 odd Shipwright Apprentices in my entry.¹⁵⁶

Paul Bird, electrical fitter apprentice entered in 1956, 15 years old:

Starting at 7 am in the dark outside the Personnel office, then being walked up as a group to our training building, the old saw mills where we were given a bench,

¹⁵³ C.J. Andrews *The Life and Times of a Dockyard Matey* (privately published, 2006), p30.

¹⁵⁴ Questionnaire 46.

¹⁵⁵ Questionnaire 7.

¹⁵⁶ Questionnaire 6.

toolbox containing basic tools such as files, hammer, tools for making things out of metal.¹⁵⁷

Fred Chapman, plumber apprentice entered in 1958, 15 years old:

I had to be up at 6am - dark and very cold. Got to the yard at 6.55am, just about found the office which I had to go to. I felt very lost and had never seen so many people and bikes at Pembroke gate area. I was told to sit down and wait with five other new lads. After about an hour a man who would be my chargehand came in and said "Right, one plumber and one bricklayer come with me". I was then taken to a workshop which would be my base for 5.5 years. I was introduced to my new "skipper" who was paid a little extra to train me and then the other nine workers based there. The time dragged so much and I hated it and wished I was back at school. I spent all day in the workshop being shown various fittings and tools and told what they were called and use for. I remember dropping an iron heavy fitting on my toe - but said I was ok so as not to make a fuss, but when I at last got home, saw my toe nail was black and hurt so much I felt my 1st day was a nightmare.¹⁵⁸

Paul Smith, electrical fitter apprentice entered in 1965, 15 years old:

Everybody seemed bigger and older than me.¹⁵⁹

The Dockyard Medical Services

Johnston and McIvor have argued that workers in nationalised industries benefitted from better occupational healthcare than those working in the private sector and that the number of private company doctors was low at least until the mid-1940s.¹⁶⁰ The National Coal Board established the Mines Medical Service in 1947 and after the Second World War, the National Dock Labour Scheme brought medical centres to dock premises.¹⁶¹ The Dockyards provided free comprehensive medical care and first aid to their employees much earlier.

The first Surgeon, John Pawson, was appointed at Chatham Dockyard in 1625. The first purpose-built surgery was erected over 90 years later and the Royal Naval Hospital was opened in Gillingham on 26 July 1905, as a replacement for the 252-bed Melville Hospital, which had been located opposite the Dockyard's Main Gate. Wright provides a

¹⁵⁷ Questionnaire 21.

¹⁵⁸ Questionnaire 38.

¹⁵⁹ Questionnaire 14.

¹⁶⁰ Johnston and McIvor 'Marginalising the Body at Work?', p130.

¹⁶¹ Johnston and McIvor 'Marginalising the Body at Work?', p131.

very comprehensive history of the development of medical services at Chatham Dockyard, including research from the letter-book of William Gunn, MD, who was appointed Surgeon in 1859.¹⁶² A new surgery was built in a more central location in the late 1860s and the building, which was used for clerical workers from the late 1960s, still remains (see figure 2.1).

Of most relevance to this study is the Medical Service as it was from 1945 until its closure. The introduction of free hospitals under the National Health Service after the War influenced the transfer of the Royal Naval Hospital, Chatham, to the Ministry of Health in 1961.¹⁶³ Until that point the hospital had provided free and convenient care for injured and diseased Dockyard workers, including radiography, physiotherapy, ophthalmology and pathology.¹⁶⁴ The Sick Quarters within the former Naval Barracks were enlarged and improved as a result of the hospital's transfer and the facilities were made available to the Dockyard Medical Officers.¹⁶⁵

Gunn had introduced a record keeping system for accidents and injury to industrial workers circa 1863 and this remained largely unaltered until 1958. In that year the Senior Medical Officer, Surgeon Commander A. W. W. Robinson and Senior Surgery Assistant, Mr R Adam, introduced a revised system, which allowed for more comprehensive record keeping and more efficient access to information, especially that needed for legal claims. The system was reviewed by a work-study team in 1959 and consequently expanded to other naval establishments.¹⁶⁶ Sadly very few of the Chatham records exist today, the majority having been destroyed when the Dockyard closed.

A new Medical Centre was established close to Pembroke Gate in 1962. This made use of a building erected in 1881 for the Engineering Department, which was converted at a cost of about £5,000. It was closer to No 1 and No 2 basins, where the majority of the afloat work was then taking place. In 1966 the complement of the Medical Centre was:

¹⁶² Wright, *The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966*.

¹⁶³ Circa four years later, after refurbishment, it re-opened as Medway Hospital. The hospital is still in operation today and since 1999 has been called the Medway Maritime Hospital.

¹⁶⁴ Wright, *The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966*, p55.

¹⁶⁵ Wright, *The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966*, p56.

¹⁶⁶ Wright, *The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966*, pp56-7.

- 1 senior medical officer
- 1 assistant medical officer
- 1 senior surgery assistant
- 5 surgery assistants
- 1 nurse
- 1 secretary
- 1 clerical assistant (responsible for the record keeping system)
- Drivers for three ambulances
- Cleaners

As with the majority of Dockyard functions, the Medical Centre and its staff were subject to naval regulations and these were contained within the Books of Reference (BR). One of the duties of the Medical Officers was to give safety lectures to ‘all apprentices in the Dockyard Training College’.¹⁶⁷ An example of education provided by the medical officer can be seen in Bonfield’s lecture about radiation (chapter 6). It would be interesting to learn what the more general lectures included, but it has not been possible to view any training notes or syllabuses that the Medical Officers would have worked to. An industrial employee’s first encounter with the Medical Centre was when he or she underwent their entry medical examination, which was also when their medical record card started.¹⁶⁸ Philip Lewing, engine fitter and turner between 1958 and 1968, mentioned his entrance medical in his recollections of work in the Dockyard:

I don’t remember much of the medical except that it took place in the Old Surgery, now The Historic Dockyard Trust Main Office. My only memory of the occasion was standing in front of a roaring coal fire and being asked by naval surgeon commander to drop my trousers, look right, cough, look left and cough!¹⁶⁹

Medical officers (not always from the Dockyards) also became involved with research into health and safety issues. The research of Surgeon-Commander Peter Harries into the hazards of asbestos dust is dealt with in detail in chapter 4. Wright’s work mentions studies of other hazards including the hazards of dust in the Ropery by the London School of Hygiene and Tropical Medicine and of noise by Surgeon Commander R. R. A. Coles, a

¹⁶⁷ Wright, *The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966*, p59.

¹⁶⁸ Wright, *The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966*, p57.

¹⁶⁹ P. Lewing *Recollections* (unpublished, 2008), p1.

naval ENT specialist. Wright also commented that the role of the Dockyard Surgeon ceased to be an isolated position:

Contacts with others in the field of Industrial Medicine are a great stimulus to better practice, and the visits arranged for students on the Occupational Health Course at the London School of Hygiene and Tropical Medicine in 1965 and 1966 serve as another example of this.¹⁷⁰

This is particularly interesting when considering the level of knowledge that the Dockyards would have had of certain hazards, including asbestos. With their connections through their profession, the medical officers would have had access to research published in medical journals. Indeed, this thesis quotes some of the published articles of Harries and others from such journals.

Johnston and McIvor argue that the marginalisation of occupational medicine in Scotland 'left a long and grim legacy of work-induced disability and premature death'.¹⁷¹ While dockyard workers undoubtedly benefitted from prompt care once they were injured or contracted an illness, the existence of the surgeries, hospitals and well-connected surgeons did not put an end to 'work-induced disability and premature death' in the Dockyards, as the following chapters demonstrate.

'Like toothpaste from a tube': Health and Safety Legislation in the Twentieth Century

Although the way that the law impacted on the Dockyards often differed to privately owned organisations, much of the legislation did apply in some way to them and the extent to which the Admiralty/Mod acted within the law when it came to health and safety issues is an important factor in assessing the level of protection that Dockyard employees were afforded.

'Health and safety' is a term that scarcely anyone in the industrial world today could claim not to have heard. As Thomas Cross reflected in a review of the impact of technological and social change on the Factory Inspectorate, a safe working environment is

¹⁷⁰ Wright, *The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966*, p62.

¹⁷¹ Johnston and McIvor *Marginalising the Body at Work?*, p141.

now expected by workers in the UK.¹⁷² Hard hats, steel toe-capped boots, goggles and high visibility clothing are common sights at industrial workplaces, building sites and other places where there are related risks; indeed failure to use health and safety equipment is now frequently punishable by immediate ejection from site and consequent loss of earnings. If our employers fail to deliver a safe working environment and we suffer as a result, we also know that we are entitled to compensation. Health and safety culture permeates almost every aspect of our lives, not just where we work and that is largely due to the threat of liability, both corporate and personal. So familiar are we with it that the term is often held in contempt and measures taken are frequently seen as obstructive. Indeed, on 29 October 2006, *Wogan's World* reported that one neighbourhood group was arranging an effigy of a health and safety officer to replace the more traditional one of Guy Fawkes for their 5 November bonfire, stating that he had 'caused more pain, suffering, misery and damage to the good of the nation than poor old Guy could dream of'.¹⁷³ We more often recall examples of extreme judgments, made in the name of health and safety, than the lives and livelihoods that the legislation protects. In April 2012, the Health and Safety Executive (HSE) launched its Myth Busters Challenge Panel to dispel some of the more far-fetched extrapolations of health and safety law.¹⁷⁴ At the same time it also released a list of the top ten worst health and safety myths, which included children being banned from playing conkers unless they were wearing goggles and trapeze artists being ordered to wear hard hats.¹⁷⁵

Legal intervention in promoting health and safety in the workplace has its origins in a much bleaker time. The Health and Morals of Apprentices Act 1802, introduced by Sir Robert Peel the Elder, followed the revelation that children were being shipped from the South of England to the North to work in the new cotton and textile mills, with detrimental effects on their health. Rather than the protection of the workforce in general, the 1802 Act concentrated on the health of vulnerable groups. It is, however, seen as the origin of health

¹⁷² T.K. Cross 'Changes in technology and social structures in the past 60 years and their impact on the inspectors work' *Her Majesty's Inspectors of Factories 1833-1983: Essays to commemorate 150 years of health and safety inspection* (HMSO: 1983), p22.

¹⁷³ <http://www.telegraph.co.uk/comment/personal-view/3633709/Wogans-World.html>

¹⁷⁴ *The Telegraph* online 11 April 2012: <http://www.telegraph.co.uk/news/politics/9196760/The-health-and-safety-myth-squad.html>

¹⁷⁵ HSE website 11 April 2012: <http://www.hse.gov.uk/myth/top10myths.htm>

and safety legislation in the UK.¹⁷⁶ Various health and safety related legislation was passed at intervals during the nineteenth century, while some Bills relating to occupational injury were less successful. For example, in 1833 Lord Ashley, recently appointed as parliamentary spokesman for the Factory Movement, brought a Factory Bill before the House of Commons. His work followed up the evidence of the Select Committee on the Bill to Regulate the Labour of Children in the Mills and Factories of the UK and recommended some strict punishments for employers, including trial for manslaughter where a child's death could be attributed to 'the culpable neglect of the occupier of the ... mill or factory'.¹⁷⁷ Although his Bill encountered stiff opposition in Parliament, it resulted in a fuller examination of factory conditions that ultimately resulted in the Factory Act 1833, which marked the first real progression in terms of protecting the industrial workforce, though it included no provisions for safety or compensation. The Act did, however, appoint the first Factory Inspectors, whose main task initially was to prevent injury and overwork in child textile workers, though the first inspectors numbered just four. Women and children were further protected by the Employment of Women, Young Persons and Children Act 1920, Hours of Employment (Conventions) Act 1936 and the Young Persons (Employment) Act 1938.¹⁷⁸

Factory legislation was subject to political pressure. It has been suggested that legislation to restrict the hours of work for women and children was designed to benefit male workers.¹⁷⁹ In other cases the protection of industry was a deciding factor, Ashley's Bill certainly failed due to the perceived impact it would have in manufacturing districts and the asbestos industry influenced the drafting of the Shipbuilding and Ship-Repairing Regulations, 1960 (see chapter 4). It can also be seen in the move from prevention to a system of civil compensation in health and safety legislation. There were three factors that underpinned the move away from the original intention to enforce compliance by way of criminal convictions. Firstly, there was acknowledgement of the political and industrial ramifications that would ensue if large sections of British industry, already fighting hard to

¹⁷⁶ N. Selwyn, *The Law of Health & Safety at Work 1998/99* (Surrey: Croner Publications Limited, 1998), p33.

¹⁷⁷ P.W.J. Bartrip, *Workmen's Compensation in Twentieth Century Britain: Law, History and Social Policy* (Hants: Gower Publishing Company Limited, 1987), pp3-4.

¹⁷⁸ For more on the development of factory legislation in the Victorian era, see Bartrip, *Workmen's Compensation in Twentieth Century Britain*.

maintain their position against foreign competition, were shut down through lack of compliance. It was also realised that the policy would encumber the courts and require an expansion in the machinery for bringing prosecutions. Finally, the fact that workers were able to bring civil actions against their employers for loss resulting from an accident at work and for neglecting their statutory duties, also played its part.¹⁸⁰

The first Workmen's Compensation Act was passed in 1897 and for the first time an Act of Parliament provided some recourse to workers who suffered financially as the result of an accident at work.¹⁸¹ This Act and its successors made provision for employers and employees to share the loss of earnings to the employee resulting from an accident. While employees still had recourse to sue for damages for negligence at common law, the Workmen's Compensation Act rendered the employer liable for up to half of the employee's loss of earnings without any need to prove the employer's negligence. Lump sums could also be made to the dependents of workers killed as a result of occupational accidents. In time the Act was seen as 'being inter alia litigious, wasteful, expensive, harmful to industrial relations and ineffective in advancing the safety, rehabilitation or the long-term financial security of recipients' and was eventually superseded by the National Insurance (Industrial Injuries) Act, 1946.¹⁸²

Diseases such as lead poisoning, phossy jaw in match manufacture, anthrax in wool sorters and hookworm in Cornish tin miners were the focus of legislation towards the end of the nineteenth century and Medical Inspectors of Factories were consequently appointed. The first was Thomas Legge, appointed in 1898. Heralded for his part in reducing the death toll from occupational disease, Legge resigned in 1926 in protest at the government's lack of support for an international convention that would ban the use of lead paints indoors.¹⁸³

¹⁷⁹Selwyn, *The Law of Health & Safety at Work 1998/99*, p33.

¹⁸⁰Selwyn, *The Law of Health & Safety at Work 1998/99*, p34.

¹⁸¹ Bartrip, *Workmen's Compensation in Twentieth Century Britain*, p2.

¹⁸² For more on the evolution of workmen's compensation, from the introduction of the 1897 Act to its succession by the National Insurance (Industrial Injuries) Act, 1946, see Bartrip, *Workmen's Compensation in Twentieth Century Britain*, P. Bartrip 'The Rise and Decline of Workmen's Compensation' in P. Weindling (ed) *The Social History of Occupational Health* (London: Croom Helm, 1985) and J. St. Leger Brockman, 'The National Insurance (Industrial Injuries) Act' *Transactions of the Society of Occupational Medicine* 21 (1971).

¹⁸³ P.A.B. Raffle *et al* (eds) *Hunters Diseases of Occupations: 8th Edition* (Kent: Edward Arnold Publishers, 1994), p15.

By 1900, legislation regarding working conditions and health and safety had become chaotic with some 19 different acts to be considered by employers, a fact reported by the Factory Commission in 1876.¹⁸⁴ The 1901 Factory and Workshop Act consolidated all of the legislation into one statute and also gave powers to the Secretary of State to make industry-specific regulations. In 1916 the Police, Factories, etc., Act introduced further powers for the Secretary of State to make Welfare Orders. These applied to washing facilities and first aid provisions, among others.

The need for compensation for industrial diseases was first officially acknowledged in 1905, though the House of Lords decreed that a disease could only be covered by the Workmen's Compensation Act if it could be proved that it was contracted by an occurrence that could be construed as an accident, based on Lord Macnaghten's affirmation, in *Fenton v. Thorley & Co. Ltd.*, that the word accident used in the contemporary vernacular, meant 'an unlooked-for mishap or an untoward event which is not expected or designed'.¹⁸⁵ While this was undoubtedly the case with the contraction of anthrax, which their Lords had been considering at the time, it became problematical for other occupationally induced conditions, such as lead poisoning, which were contracted over a period of time.¹⁸⁶ In 1906, the Departmental Committee on Compensation for Industrial Diseases, chaired by Herbert Samuel MP, added to the Schedule a further 18 diseases that caused incapacity of more than a week and for which causation by employment could be established.¹⁸⁷

The 1937 Factories Act removed the distinction between premises where mechanical power was used and those where it was not and also between textile and non-textile factories. Thus it applied to almost all premises employing manual labourers or those making, repairing, altering or adapting any item for sale.¹⁸⁸ It also introduced requirements for means of escape, maintenance of floors and stairs and others aimed at reducing non-machinery-related hazards. Minor amendments were brought by the 1948¹⁸⁹ and 1959

¹⁸⁴ Selwyn, *The Law of Health & Safety at Work 1998/99*, p33.

¹⁸⁵ Bartrip, *Workmen's Compensation in Twentieth Century Britain*, p26.

¹⁸⁶ Bartrip, *Workmen's Compensation in Twentieth Century Britain*, p26.

¹⁸⁷ Industrial Injuries Advisory Council website: <http://iiac.independent.gov.uk/about/index.shtml>.

¹⁸⁸ E. Crooks, *The Factory Inspectors: A Legacy of the Industrial Revolution* (Stroud: Tempus Publishing, 2005), p199.

¹⁸⁹ E.g. *Factories Act 1937 (Extension of Section 46) Regulations 1948* extended Section 46 to include canteens.

Factories Acts and the Factories Act 1961 provided further consolidation of statutes. Parts of the 1961 Act were still in force well into the 1990s.¹⁹⁰

The National Insurance (Industrial Injuries) Act was passed in 1946 and came into effect on 4 July 1948. One of the benefits of the new Welfare State that emerged from the Beveridge Report after the Second World War was that it made workmen's compensation a social service rather than part of the employers' liability system. Almost everyone employed under a contract of service or apprenticeship was now insured against personal injury and payments came from an insurance fund that was financed through contributions from workers, employers and Government.¹⁹¹ The Act was written to deal with the consequences of "personal injury by accident arising out of and in the course of employment". This wording had the effect of continuing the distinction between accident and disease that had been entrenched by the Workmen's Compensation Acts. By 1948, however, the Schedule of Prescribed Diseases had grown to include 41 diseases. The National Insurance (Industrial Injuries) Act was amended almost annually until its final consolidation in 1965.¹⁹²

The Employers' Liability (Compulsory Insurance) Act 1969 is still in force and requires employers to maintain insurance against liability for bodily injury and disease sustained by its employees arising from their employment. Furthermore the insurance must be with authorised insurers and must provide at least £2m of cover for every occurrence of injury or disease, though a cap of £10m was set by the Association of British Insurers in 1999.¹⁹³

Health and safety legislation up to 1961 achieved some success in reducing industrial accidents and in improving the general level of occupational health and welfare. The underlying statistics, however, revealed that there was still a long way to go. Sirrs argues that the piecemeal and sporadic development of legislation in these areas was reactive in nature, giving as one example 'the tightening up of fire precautions in 1959

¹⁹⁰ Selwyn, *The Law of Health & Safety at Work 1998/99*, p33.

¹⁹¹ Bartrip, *Workmen's Compensation in Twentieth Century Britain*, p212.

¹⁹² St. Leger Brockman, 'The National Insurance (Industrial Injuries) Act', p113.

¹⁹³ Selwyn, *The Law of Health & Safety at Work 1998/99*, p131.

following a mill fire in Keighley, West Yorkshire, which killed 8 people'.¹⁹⁴ Industrial development in the mid to late twentieth century brought with it a need for a different approach to health and safety legislation. Nuclear power plants and oil refineries, for example, 'meant safety solutions had to be engineered into industrial systems from the earliest design stages'.¹⁹⁵ In contrast to the earlier method of responding to risks as they presented themselves, they now had to be 'identified and assessed before they were realised'.¹⁹⁶ In May 1970, Barbara Castle, Secretary of State for Employment, set up a committee on health and safety of people at their place of work under the chairmanship of Lord Alfred Robens of Woldingham, who was then Chairman of the National Coal Board.

As well as looking at the incidence of injuries and fatalities, the Committee considered health and safety in other major industrial nations.¹⁹⁷ It investigated a situation that differed in many respects to that which had pertained in the early days of industrial revolution. Employees now had much more say about the conditions they worked in, particularly through trade unions. Children had been less of a concern in terms of their exploitation in the workplace since the introduction of the compulsory education to the age of 14 under the 1918 Education Act, the school leaving age had increased to 15 years as a result of the Butler Education Act in 1944 and the Family Allowances Act, 1945, provided additional income for families with more than one child. But other hazards and risks had arisen due to changes in technology and working practices. In its report, published 1972, the Robens Committee concluded that the legislation in place was ineffective in halting the large numbers of people killed or injured at work each year. Moreover, the obscurity and proliferation of legislation made it difficult for employers to understand and it was frequently out of date. Confusion was also engendered by the overlapping jurisdictions of the various enforcement authorities. The Committee found that apathy was 'the greatest single contributing factor to accidents at work. This attitude will not be cured so long as people are encouraged to think that health and safety at work can be ensured by an ever-

¹⁹⁴ Wellcome Library Ref 2010/SIR: MA History of Medicine Dissertation: C. Sirrs *Health & Safety in the Age of Risk: Britain 1960-1995: The HSE and Beyond* (London: Wellcome Trust Centre for the History of Medicine at University College London, 2010), p14.

¹⁹⁵ Sirrs *Health & Safety in the Age of Risk*, p15.

¹⁹⁶ Sirrs *Health & Safety in the Age of Risk*, p15.

¹⁹⁷ J. R. Ridley and J. Channing *Safety at work* (London: Butterworth-Heinemann, 2003), p67.

expanding body of legal regulations enforced by an ever-increasing army of inspectors'.¹⁹⁸ Robens believed that employers and those working with hazards should take primary responsibility for health and safety. The Committee recommended:

A comprehensive and orderly set of revised provisions under a new enabling Act. The new Act should contain a clear statement of the basic principles of safety responsibility. It should be supported by regulations and by non-statutory codes of practice, with emphasis on the latter. A determined effort should be made to revise, harmonise and update the existing large body of detailed statutory regulations, to simplify their style and to reduce their number. The scope of the new legislation should extend to employers, employees and self-employed.¹⁹⁹

The recommendations of the Committee were implemented by Parliament under the Health and Safety at Work Act 1974 (HSWA), which became active on 1 April 1975.²⁰⁰ Besides measures designed to improve health and safety law making, the new HSWA meant:

1. that all employees except domestic servants were brought within the scope of the Act and given a measure of protection at work, which extended legislative provision to approximately 8 million people, who had not hitherto been covered;
2. increased powers of inspectors to reduce some of the bureaucratic and time-consuming enforcement procedures;
3. that new legal requirements were imposed for those manufacturing, importing, designing and supplying articles and substances that are to be used in the workplace;
4. the acceptance of the concept of putting responsibility where authority lay, i.e. with the employer and of the need for commitment to health and safety at senior levels in an organisation;
5. it was recognised that employees were not the only ones who had a right to protection from the effects of the way work was carried out (i.e. members of the public should also be protected);
6. confirmation of the role that employees had to play in ensuring their health and safety;

¹⁹⁸ A. Robens *Safety and Health at Work: Committee Report, 1970-72* (HMSO: 1975).

¹⁹⁹ Robens, *Safety and Health at Work*

²⁰⁰ *The Times* 31 December 1975, p7.

7. a greater degree of self-regulation through the use of own rules and codes of practice;
8. the introduction of a Health and Safety Executive with duties to educate and inform, carry out and publish research, and with powers to direct investigations and inquiries;
9. provision was made for the appointment by recognised trade unions of safety representatives from among the employees, to represent them in consultation with employers.

The HSWA replaced the rigid demands of earlier legislation with more general duties and required compliance with these ‘so far as is reasonably practicable’.²⁰¹ Its focus was also based on hazard analysis and risk assessment, which originated in the nuclear industry. The enactment of HSWA came two months after the Court of Inquiry into the explosion at the Flixborough Works of Nypro (UK) Ltd, which killed 28 employees and injured 36 employees and 53 members of the public. The Court of Inquiry accepted that ‘No plant can be made absolutely safe anymore than a car, aeroplane, or home can be made absolutely safe’.²⁰² The danger of assuming that a site was absolutely safe was acknowledged for its adverse impact on individual and organisational alertness to hazards.

The HSWA applied during the final years of operation at Chatham Dockyard. As for most employers, it introduced a great deal of change and new bureaucracy. Efforts were certainly made to inform workers of their part in maintaining a safe working environment at an official level. Memoranda, pamphlets and notices evidenced the drive to bring workers up to speed with their responsibilities. *Periscope* contained articles regarding the new legislation; for example, the December 1976 issue featured an article about the Naval Base Health and Safety Division’s campaign to make the Dockyard a safer workplace, indicating that:

... from the Port Admiral downwards, everyone in the Naval Base is being given educational courses by the Division to make them aware of their responsibilities under the new Health and Safety at Work Act.²⁰³

²⁰¹ Crooks *The Factory Inspectors*, p204.

²⁰² Crooks *The Factory Inspectors*, p205.

²⁰³ *Periscope* December 1976, p6.

According to the article, nearly 400 employees had taken part in a one-day course in a Safety Centre located in the Dockyard. The article talks in most detail about a lecture by Bill Ware, Safety Officer, which was about Hazard Spotting and during which he showed a film entitled 'Safety in Shipbuilding'. The article also quotes statistics used by Ware: in 1975 there had been 248 reportable injuries at Chatham Dockyard, which accounted for 39,432 lost man hours. This compared with 8,000 reportable injuries in the shipbuilding industry as a whole, including 18 deaths. According to the article, 700 of those accidents had been caused by people falling, 640 by falling objects and 300 by incorrectly secured ladders.²⁰⁴ By February 1978, 2,022 management and non-industrialists, 28 non-industrialist safety representatives and 150 industrial safety representatives and shop stewards had attended the one-day course. Training for the 4,000 industrialists and further training for safety representatives was to follow.²⁰⁵

Almost a year later, an article by chief health and safety officer, Keith Slade, called on workers to help improve health and safety in the Dockyard, following the issue of Naval Base Health and Safety Memo 5/77. The memo had detailed the method of working and functions of safety representatives at the Dockyards. Slade states that the decision to appoint safety representatives was an:

...important step towards the implementation of this part of the Health and Safety at Work Act, [which] throws up a challenge to all levels of management and the Trade Unions, in developing good relationships for the smooth working of this aspect of the Act – namely, total involvement, with management and workforce both working together to improve health and safety standards.²⁰⁶

After the HSWA, specific and related legislation followed. Those that were introduced before the Dockyard's closure in 1984 included the Protection of Eyes Regulations, 1974; Woodworking Machines Regulations, 1974; Safety Representatives and Safety Committees Regulations, 1977; Safety Signs Regulations, 1980; Notification of Installations Handling Hazardous Substances Regulations, 1982; Control of Lead at Work Regulations, 1980; Notification of Accidents and Dangerous Occurrences Regulations, 1980 and the Health and Safety (First Aid) Regulations, 1981. This long and varied list prompted Len Norman,

²⁰⁴ *Periscope* December 1976, p6.

²⁰⁵ *Periscope* February 1978, p9.

²⁰⁶ *Periscope* October 1977, p6.

Chief Health and Safety Officer, to state “Legislation on safety at work is now coming out like toothpaste from a tube”.²⁰⁷

An important difference between the Dockyards and other industrial organisations is their ownership. As they are Royal establishments they are covered by Crown Immunity. The Crown is immune from criminal prosecution because the law that governs this is set by statute and it would seem improper for the Crown to be prosecuting itself. It is not, however, immune from legal obligations under health and safety legislation. If a Dockyard (or other Crown establishment) breaches health and safety law, it may be censured where that breach would ordinarily have led to prosecution. Indeed, Rosyth Dockyard was censured on 14 counts in 1985 in relation to protection against asbestos.²⁰⁸ A discussion within the Industrial Whitley Committee meeting held on 3 April 1952, suggests that compliance with the Factory Acts was pushed for by the unions and also that the threat of a visit by a Factory Inspector was still unwelcome, despite crown immunity. When the Staff Side informed that certain requirements of the Factory Acts had not been fulfilled, including the whitewashing of workshops and provision of seats, hand basins, towels and soap and the cleaning of windows, there was some reticence on the Official Side to address them because of financial constraints. Mr Thomas of the Staff Side appeared to threaten to bring in the Factory Inspector, stating ‘he would insist on matters being put right’ though his colleague Mr Dolling advised against it.²⁰⁹ By the next meeting some matters were already being addressed and funding had been requested from the Admiralty to take care of the rest.²¹⁰ While the Dockyards may be protected from prosecution by the Factory Inspectorate for breaches of health and safety law, this does not extend to civil claims such as those brought by workers for injury or incapacity incurred through their work or from the dependents of workers killed as a result of their job. The Factory Inspectors certainly visited the Dockyards and their advice was sought in some circumstances. Chapter 5 provides an example of an informal discussion between HM senior medical inspector of

²⁰⁷ *Periscope* July 1978, p5.

²⁰⁸ Johnston and McIvor *Lethal Work*, p18.

²⁰⁹ RDL, Minutes of the 151st Meeting of the Chatham Yard Industrial Whitley Committee Held on Thursday, 3rd April, 1952, p128.

²¹⁰ RDL, Minutes of the 152nd Meeting of the Chatham Yard Industrial Whitley Committee Held on Thursday, 3rd July, 1952, p131.

factories, Dr T A Lloyd-Davies and the medical director general of the Navy regarding the proposed study of asbestos-related disease at Devonport Dockyard.

There were other exemptions to legislation that Chatham Dockyard, as a publicly funded entity, fell under. For example, the Employers' Liability (Compulsory Insurance) Regulations did not (and still do not) apply to nationalised industries and other publicly funded entities. Claims against the Ministry of Defence were paid by the Treasury. Though this has been generally noted, a detailed account of which legislation and regulations applied to the Dockyards is not included in the study, except where a particular act or regulation is considered when forming conclusions regarding the management of a specific health and safety risk.

Table 2.1: Vessels Completed/Cancelled at Chatham Dockyard 1945 to 1951		
Year	Vessels Completed	Vessels Cancelled
1945	<i>Thermopylae</i>	<i>Adept</i>
		<i>Nonsuch</i>
		<i>Nymphe</i>
1947	<i>Acheron</i>	
1951	<i>Vidal</i>	<i>Wharton</i>
Source: P. MacDougall <i>The Chatham Dockyard Story</i> (Kent: Rochester Press, 1981), p182.		

Table 2.2: Major Dockyards				
	Opened	Closed	Number of Men at Peak	1980
Portsmouth	1212		17200	7400
Devonport	1690		16400	12700
Chatham	1559	[1984]	14500	6000
Pembroke	1809	1925	3600	
Sheerness	1665	1960	3300	
Rosyth	1916	1925-38	7000	5900
Haulbowline (Queenstown)	1806	1925	2000	
Bermuda	1798	1950	1200	
Gibraltar	1740		4000	1300
Malta	1814	1959	10800	
Simonstown	1861	1957	600	
Singapore	1937	1969	3200	
Hong Kong	1856	1959	4200	
Woolwich	1650	1869		
Deptford	1513	1869		
Source: D.K. Brown <i>A Century of Naval Construction: The History of the Royal Corps of Naval Constructors</i> (London: Conway Maritime Press, 1983), p272.				

Table 2.3: Submarines built at Chatham Dockyard			
Name	Date completed	Name	Date completed
<i>C.17</i>	13.08.1908	<i>Swordfish</i>	10.11.1931
<i>C.18</i>	10.10.1908	<i>Sturgeon</i>	08.01.1932
<i>C.19</i>	20.03.1909	<i>Seahorse</i>	15.11.1932
<i>C.20</i>	27.11.1909	<i>Starfish</i>	14.03.1933
<i>C.33</i>	10.05.1910	<i>Shark</i>	31.05.1934
<i>C.34</i>	08.06.1910	<i>Snapper</i>	25.10.1934
<i>D.7</i>	14.01.1911	<i>Grampus</i>	25.02.1936
<i>D.8</i>	23.09.1911	<i>Sunfish</i>	30.06.1936
<i>E.1</i>	09.11.1912	<i>Sterlet</i>	22.09.1937
<i>E.2</i>	23.11.1912	<i>Seal</i>	27.09.1938
<i>E.7</i>	02.10.1913	<i>Tigris</i>	31.10.1939
<i>E.8</i>	30.10.1913	<i>Torbay</i>	09.04.1940
<i>E.12</i>	05.09.1914	<i>Umpire</i>	30.12.1939
<i>E.13</i>	22.09.1913	<i>Una</i>	10.06.1941
<i>F.1</i>	31.03.1915	<i>Splendid</i>	19.01.1942
<i>G.1</i>	14.08.1915	<i>Sportsman</i>	17.04.1942
<i>G.4</i>	23.10.1915	<i>Tradewind</i>	11.12.1942
<i>G.5</i>	23.11.1915	<i>Trenchant</i>	24.03.1943
<i>G.2</i>	23.12.1915	<i>Shalimar</i>	22.04.1943
<i>G.3</i>	22.01.1916	<i>Turpin</i>	05.08.1944
<i>R.1</i>	25.04.1918	<i>Thermopylae</i>	27.06.1945
<i>R.2</i>	25.04.1918	<i>Acheron</i>	25.03.1947
<i>R.3</i>	08.06.1918	<i>Oberon</i>	18.07.1959
<i>R.4</i>	08.06.1918	<i>Onslaught</i>	17.09.1960
<i>X.1</i>	16.06.1923	<i>Ocelot</i>	05.05.1962
<i>Oberon</i>	24.09.1926	<i>Onyx</i> ²¹¹	23.09.1965
<i>Odin</i>	05.05.1928	<i>Onondaga</i>	22.06.1967
<i>Parthian</i>	22.06.1928	<i>Okanagan</i>	22.06.1968
<i>Rainbow</i>	14.05.1930		

²¹¹ Completed as HMCS *Ojibwa*



Figure 2.1: The Old Surgery. This was the second purpose built surgery in the Dockyard, completed in the late 1860s. It was replaced by a Medical Centre closer to work in the basins in 1962. Today it is part of the University of Kent's Medway Campus.

Source: Author's own photograph (colour formatted to greyscale).



Figure 2.2: Advertising hoarding at Gillingham Football Club's Priestfield Stadium, 1979. At the time Gillingham FC was the only Kent-based club in the Football League and in the early 1980s its ground had a capacity of 22,000. The hoarding was ordered in time for the start of the new season and a short article was also published on the front page of the September 1979 edition of *Persicope*. Source: RDL 2007.0069.17 PHA 14973 (black and white).

Chapter 3

‘Cold. Wet. Noisy. Degrading.’²¹²: Hazardous work in Chatham Dockyard

The building and repair of ships can be a dangerous business. In every shipyard there is a concentration of the hazards of conventional manufacturing industry but magnified because so much of the work is done at great heights or in small spaces. There are also risks peculiar to the industry and, in addition, there is the influence of the climate: many operations have to be done in the open air and most shipyards are located on the coldest or wettest estuaries.²¹³

HSE, 1980

Johnston and McIvor define shipbuilding as one of the most dangerous industries in England and Scotland, alongside coal mining and construction.²¹⁴ The Factory Inspectorate recorded higher accident rates in the shipbuilding, ship-repairing and marine engineering industries, than those recorded in the manufacturing and construction industries (see table 3.1). In the post-1945 period, Chatham Dockyard was engaged in shipbuilding (albeit on a declining basis), ship-repairing and marine engineering. The risks present at the Dockyard combined traditional ones, such as falls from height, falling objects, hernias and foreign bodies in the eyes, with new ones introduced as a result of technological advances and different working methods. Industrial workers toiled with heavy machinery, with sharp tools, in confined spaces (including boilers, fuel oil tanks, coal bunkers, etc.), in dock bottoms or at height, near welding sparks and flying debris. An example of the type of confined space that much work took place in is shown in figure 5.3. Robert Smith, a fitter apprentice from 1958 to 1962, remembered fitting pipes in a submarine’s compensation tanks:

... they stink to high heaven as a heavy residue of [fuel oil] cannot be completely removed, and the ventilation is inadequate ... The only entrance or exit from these tanks is via a manhole cover, oval in shape and approximately 18” (less than 50cm)

²¹² Questionnaire 39.

²¹³ Health and Safety Executive (HSE) *Shipbuilding and Ship-repairing Health and Safety 1971-78* (London: HMSO, 1980), p2.

²¹⁴ Johnston and McIvor ‘Marginalising the Body at Work? Employers’ Occupational Health Strategies and Occupational Medicine in Scotland c. 1930-1974’ *Social History of Medicine* 21:1, p129.

at its largest point. After half an hour in these tanks you had to get out into the fresh air to clear your head. This in itself was a difficult exercise, almost as if the submarine was giving birth! A couple of wandering leads were all the light available, and these were only permitted once the tanks had been subject to a ‘gas free’ test, to ensure that all the explosive gases inside the tanks had been extracted.²¹⁵

Working in certain jobs brought workers into close contact with asbestos, nuclear radiation and other toxic substances. Workers afloat were often in close proximity to deep water or steep drops, depending on whether the docks were in a flooded or dry state.²¹⁶ Conditions were frequently extremely hot or extremely cold and they were dirty, dusty and noisy. Fitter and turner Phillip Lewing recalled working on the refit of HMS *Chichester* during the winter of 1963:

It started snowing on Boxing Day and the snow and ice was still around at Easter 3 months later. During this time we were in dry dock where large areas of the ships plates, from just above the waterline down to the keel were removed for renewal. It was extremely cold and the wind whistled through the ship, the temperature rarely got above freezing. We had to bounce our tool bags on the deck in the morning because the spanners had froze and stuck together overnight. We just got on with, it came with the job.²¹⁷

Lewing also observed:

Gangs of men working afloat would often live on the ship under refit, gathered together in their respective trades and each man sitting on his own tool box. These men would set up “home” in any available compartment including engine room and boiler rooms, sometimes knee deep in asbestos lagging. Hot water for a brew (tea) was obtained from a brazier burning on the dockside and sometimes down the bottom of the dry dock; each man carried his own “billy can” (these braziers were eventually replaced by large self filling electric emersion heaters dotted around the yard). The men would relocate to different parts of the ship as the refit progressed finally moving ashore when the job finished.²¹⁸

The primary purpose of this chapter is to facilitate understanding of the environment within which Dockyard employees worked. It provides examples of the risks faced every day by workers and of some extreme incidents that demonstrate how severe the consequences

²¹⁵ R. Smith *A Dockyard Apprentice's Story: Hard graft, scrapes and japes on the long road to becoming a trained engineer* (Gloucestershire: Memoirs Publishing, 2012), p60.

²¹⁶ The term ‘afloat’ refers to work aboard ships rather than in a workshop.

²¹⁷ Lewing *Recollections*, p5.

²¹⁸ Lewing *Recollections*, p10.

could be when things went wrong. It also provides analysis of causal factors, particularly in relation to major accidents for which official inquiries were conducted.

Of the 65 respondents to the initial questionnaire, 17 suffered from one or more work-related conditions, including asbestos-related diseases, industrial deafness, loss of sight, claustrophobia, arthritis of the spine and allergies. Since collating these responses, a number of cases of asbestos-related disease and cancers caused by exposure to radiation have also been recorded for the study. A survey of a small selection of Hurt Books provided examples of the conditions that men and women worked in.²¹⁹ Although not a representative sample, it gave an indication of the types of accidents that befell workers. A total of 471 injuries were found in these records (see table 3.2). Table 3.3 provides industry statistics for a nine month period circa 1978. Though direct comparison was not possible with the Dockyard figures, these did suggest that there were common risks and trends across the shipbuilding and ship-repairing industry. Men who sustained injury during work were often put on restricted duties until they had fully recovered; some with permanent disabilities were on restricted duties indefinitely. In 1965, 249 or 3% of the Dockyard workforce was on restricted duties due to injuries or disability sustained at work.²²⁰

The most common injuries in the Hurt Books were caused by large items that slipped or fell onto workers. These were often very heavy items like steel plates, lengths of pipe, iron blocks and angle iron. One example of this type of injury occurred in 1960 and involved two boilermaker apprentices who had been trying to obtain an 8' x 4' x 1/8" plate on the inside of a stack. One had tried to hold a number of plates back so that the other could get to the plate required, but the weight was too much and the plates fell onto the first apprentice, fracturing his shin bone.²²¹ Injury to the toes from falling objects was commonplace and in most cases would have been prevented by protective footwear. 'Toe-

²¹⁹ Physical injuries sustained in the Dockyards were referred to as 'hurts' and the workers who suffered them were entered on 'hurt lists' or in 'hurt books'. Men suffering from illness or injuries not sustained in the Dockyards were entered on the 'sick list'. For more see R. Biddle 'Naval Shipbuilding and the Health of Dockworkers c1815-1871' *Family & Community History* 12:2 (2009), p110. The RDL holds the following examples, which were used in the study: Boilershop Hurt Note Book (D189) 1942 to 1947 (only accidents dated 1946 to 1947 entered in database); Boilershop Hurt Note Book (D 189) 1947 to 1960 (2 volumes); National Insurance (Industrial Injuries) Act 1949 Accident Book (form B.I. 510A) Mould Loft 1977 to 1983; Minor Injury Reports Hurt Book 1954 to 1971 – Plumbers Shop; Records: Minor Accidents No 2 Smithery From 27.4.60 to 20.12.61.

²²⁰ Wright, *The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966*, p60.

²²¹ Boilershop Hurt Note Book (Volume 1), 1960.

tectors' were available for workers to purchase before 1966, by which time a 'Footwear Centre' was located in the Dockyard and a scheme that allowed workers to buy safety boots and shoes by instalments and by deductions from their wages had recently been introduced.²²²

Foreign bodies and substances in eyes were also very common. Biddle argues that an increase in eye injuries accompanied the use of metal in shipbuilding in the mid-1800s. This was predominantly due to sparks caused when the metal was being worked and in 1868 prompted the surgeon at Portsmouth Dockyard to request permission to procure an ophthalmoscope.²²³ In the most serious cases, loss of sight occurred. The Hurt Books contain the record of a boilermaker who lost his sight after a foreign body entered his left eye in 1946. A supplementary note records that the man had trouble judging distances as a result and for this reason and because of the risk to his 'one good eye', he was to be found work that did not involve grinding or chipping; no mention was made of provision of protective eye wear.²²⁴ At just 18 years old shipwright Norman Gifford also lost the sight in one of his eyes:

... I was a third year [apprentice] working on submarines in No 7 [slip] just opposite [the Masthouse] and had a piece of metal in my eye and lost the sight of my eye, I was 18, and they were going to terminate my apprenticeship.²²⁵

Gifford's trade union fought on his behalf to save his position and even won him time to study for a promotion to the Drawing Office; presumably this was considered to be work that was of the least risk to his functioning eye. This action falls within the typical activity of trades unions and although no examination of the relationship between the unions and health and safety is attempted within this thesis, it is worth noting Johnston and McIvor's comments on the subject:

Trade unions have always been in an uncomfortable position regarding occupational health and safety, as although they were in the front line of defence against dangerous work practices, their main *rationale* was to represent their members'

²²² *Periscope* 22 February 1967, p6.

²²³ Biddle 'Naval Shipbuilding and the Health of Dockworkers C1815-1871', p113.

²²⁴ Boilershop Hurt Note Book (Volume 1), 1946.

²²⁵ Group interview: G2003/3.

interests, and this frequently meant that wages and working hours were prioritised over occupational health matters.²²⁶

Hence, efforts to maintain Gifford's employment were a priority, but it was unlikely that any fuss was made about the provision of eye protection for workers. Ron Harfleet, shipwright then recorder from 1943 to 1984, recalled that another man, who lost the sight in one eye after getting a fragment in it while using a hammer and cold chisel, committed suicide because he thought he was going blind in the other eye too.²²⁷

Despite the introduction of the Protection of Eyes Regulations 1974, eye injuries continued to occur. Eye injuries accounted for three per cent of the accidents recorded across the UK shipbuilding industry by the HSE in the late 1970s (see table 3.3). Almost all of these occurred in operations for which eye protection should have been worn.²²⁸ Eye injuries were apparent in the Dockyard records too. Two eye injuries were recorded in the Mould Loft Accident Book after 1974. In 1977 a shipwright working under HMS *Lincoln* got a particle of anti-fouling paint in his left eye and in 1980 another shipwright got a dust particle in his eye whilst passing the Smithery while a chimney was being demolished.²²⁹ The launch of a campaign to reduce the number of eye injuries in July 1978 suggests that the problem persisted long after the legislation came into force. Workplaces where there was a high risk of this type of injury were designated "eye protection areas" and anyone working within them was instructed to wear eye protection. One-day training courses were provided for supervisors and safety representatives specifically on eye-safety and notices that conformed to British and European standards for industrial safety were displayed in high risk areas. These signs warned employees that they should wear eye protection even if they were not directly involved with a high-risk trade, such as welding or chipping. Indeed, it would seem that the campaign was directed at those working in the vicinity of dangerous trades:

"It is the fringe areas that concern us," said Len Norman, Chief Health and Safety Officer ... "Although a welder would use a hand screen and a chipper would use an

²²⁶ Johnston and McIvor *Lethal Work*, p147.

²²⁷ G2003/3.

²²⁸ HSE *Shipbuilding and Ship-repairing Health and Safety 1971-78*, p3.

²²⁹ RDL National Insurance (Industrial Injuries) Act 1946 Accident Book (Form B.I. 510A) Mould Loft 1977 to 1983.

eye shield, how many people working nearby would think of using some form of eye protection?”²³⁰

Welder’s flash was also a risk to the eyes, generally afflicting those working near welding work rather than welders themselves, who, as the quote above states, would normally be using eye protection. A former shipwright apprentice at John Readhead & Sons described what it was like to suffer a welder’s flash:

What would happen was that you would feel your eyes go watery and you’ve got no idea what the pain was like in your eyes by the time you got home. It was like really hot burning. You used to put apple or cucumber on your eyes to try and keep them cold. That used to last about fifteen to twenty hours and you could get it twice a week.²³¹

The available Chatham Dockyard Hurt Books record 13 cases of welder’s flash. All were recorded in the Boilermakers’ records and most occurred in 1946 and 1947.

Slips, trips and falls were common and once winter came in the Dockyard, the accident books contained predictable slips in snow and ice. Scaffolding and staging was used throughout the Dockyard and the accident photographs provided examples of falls from the equipment or from its collapse (see figure 3.1 for an example). *Periscope* also contained an article regarding the collapse of staging during work on HMS *Kirkliston*. Luckily the four workers, who were thrown from the staging, landed in a dock full with water and were not seriously injured.²³²

Mobile cranes were also a source of danger for workers. Apart from the obvious risk of straying into the path of a travelling or mobile crane, there were also accounts of them toppling over. One dramatic example was reported on the front cover of *Periscope* in 1971. The driver, Robert Arnall, ‘leapt to safety’ when the jib whipped back and crashed into the cabin, after the crane’s wheels slipped off of the rail track. Arnall was very lucky not to have sustained serious injury and commented: ‘It shook me up a bit but I only grazed my thumb and was back at work next day. I love the job.’²³³ One of the accident

²³⁰ *Periscope* July 1978, p5.

²³¹ D. Hall *Working Lives: The forgotten voices of Britain’s post-war working class* (London: Bantam Press, 2012), p184.

²³² *Periscope* May 1966, p1.

²³³ *Periscope* December 1971, p1.

photographs (figure 3.9) records an injury to a worker named Groombridge in 1973. Although a definite account of the accident was not included with the photograph, the annotation suggested that Groombridge was crushed by the crane.

Inguinal hernias also occurred frequently.²³⁴ The cause among Dockyard workers was generally straining to lift or slipping while carrying large or heavy objects. The HSE attributed this kind of injury to workers who, ‘unlike their predecessors, are unaccustomed to regular heavy manual work’. While this may be accountable in some cases, Morris observed that one per cent of the workers discharged as sick from Chatham Dockyard in 1800 and 1801, when regular heavy lifting was a common aspect of the work, also suffered hernias.²³⁵ Hernias and muscle strains were also common throughout the later 1800s. Indeed, they were so common in the late 1820s, that the Admiralty conducted trials of ‘off the peg’ trusses to treat them.²³⁶

As may be expected with so much ‘hot’ work in shipbuilding and ship-repairing, fires were relatively common. While many were quickly extinguished and caused little injury or damage, this was not true for all of them. The fire that destroyed No 2 Covered Slip in 1966 was the biggest fire in the period and is covered in detail later. In 1967, boilermaker and welder Keith Langley suffered multiple burns when a drum of pyrene thinners exploded and caught fire; he had been working inside an underground tank.²³⁷ In 1968, three fires were reported in the local press in as many weeks. The first fire was inside the funnel of destroyer HMS *Kent*. Caused by a mixture of soot and diesel fumes, it was serious enough for the Medway and Strood fire stations to be called to assist the ship’s fire fighting crew.²³⁸ Two days later it was reported that fires had broken out in the torpedo room and the engine room of the Oberon class submarine HMS *Orpheus*; both were caused by welding sparks igniting waste material. This article also referred to a more serious blaze aboard the nuclear submarine HMS *Valiant* three weeks earlier.²³⁹ In November 1975

²³⁴ This is the protrusion of part of the intestine through a hole in the intestinal wall; it happens most commonly in later life and is usually caused by obesity or hard physical work.

²³⁵ R. Morris, *The Royal Dockyards during the Revolutionary and Napoleonic Wars* (Leicester University Press, 1983), p99.

²³⁶ Biddle ‘Naval Shipbuilding and the Health of Dockworkers C1815-1871’, pp 110-111.

²³⁷ *Periscope* January 1967, p1.

²³⁸ *Evening Post* 4 September 1968, p1.

²³⁹ *Evening Mail* 6 September 1968, p2.

burner Charlie Ledger and a labourer were lucky to escape when fire erupted in the fin of the Brazilian submarine *Toneleiro*. The submarine had already been badly damaged by fire during fitting out by Vickers and had been sent to Chatham Dockyard for repairs. Crane driver Harry Tranah heard the men calling for help and ran his crane down the side of the dock, swung a tray out to the fin and the men climbed into it. Ledger recalled that ‘at the height of the incident “vicious flames, like an oil fire” were leaping up 30-40 feet ... “We were lucky because we both had our masks on. Only our pride was hurt. If it had not been for the crane driver, we would not have been able to get out”’.²⁴⁰

Some accidents would appear to have been caused by carelessness, such as the yard boy (14 years old) who in 1946 caught his foot in his own overalls and fell and bruised his knee on the concrete floor and the apprentice boilermaker who fell over his own tool box and injured his left ankle.²⁴¹

Rudyard Kipling’s *The Secret of the Machine* warned the operators of early machinery about the dangers of complacency: ‘We can neither love nor pity nor forgive. If you make slip in handling us you die!’²⁴² As the twentieth century progressed machinery was made safer with guards, etc., and photographs from the RDL archive show examples of instructions to workers about using them (see figure 3.6). Certainly accidents related to the use of machinery were among the lowest numbers recorded in the Hurt and Accident books, with just 15 cases compared to 37 accidents that occurred while using hand tools. Occurrence of machinery related accidents was also low in the industry statistics. Human error ensured, however, that hazards from machinery remained. Figure 3.3 shows a generator in which electrical fitter T. Mitchell injured a finger, after a colleague failed to replace the safety cap. He was attempting to reach the control knob (1) and caught his finger (2) while the rotor was revving at 2400 rpm.

Fatal accidents were relatively unusual in the post-1945 period, but the fact that they did occur provides further evidence of the dangerous nature of Dockyard work. Lewing saw a colleague crushed to death during the refit of HMS *Chichester*:

²⁴⁰ *Periscope* December 1975, pp1 & 7.

²⁴¹ Boilershop Hurt Note Book (Volume 1), 1946; Boilershop Hurt Note Book (Volume 2), 1954.

²⁴² R. Kipling ‘The Secret of the Machines’ in C.R.L. Fletcher and R. Kipling *A School History of England* (Oxford: Clarendon Press, 1911).

Albert was a Leading Slinger who worked with us most of the time. He was well past retirement age, nearer his middle seventies. He was a big strong man, remarkably fit for his age with a wealth of experience. A large hole had been cut in the upper deck so that machinery and equipment could be lifted ashore for refit. On this occasion Albert was inboard, guiding the dockside crane whilst slinging two large control panels ashore. Unseen one of the panels caught on the side of the hole causing both of them to slide through the sling. One fell clear but the other fell to the deck crushing poor Albert against the bulkhead. We all heard this tremendous crash; it was just above our heads. Rushing to help there wasn't much we could do; Albert never recovered consciousness and died in hospital four days later.²⁴³

The Civil Engineer In Chief's (CEIC) Departmental Whitley Committee minutes also contained examples. On 3 May 1956, a 'fatality in the department' was used to underline the importance of safety matters.²⁴⁴ Further investigation revealed that the man was skilled labourer Thomas Rose, who was drowned after being pulled overboard by a mooring wire. The inquiry into his death found that Rose was 'interfering with the running of the wire from Harbour Launch *W121* when laying out this wire from the buoy to the piling float, though he had been expressly told not to do so' and that this had caused the accident. It also uncovered a number of failings in terms of safety and seamanship in a process that the department had been using without incident for several years.²⁴⁵ The second fatality by electrocution involved a worker from a different department who it appears was using electrical plant operated by wandering leads that were not properly earthed. The minutes record a direction to the chief foreman of works to check that all such appliances in the CEIC department's use were properly earthed.²⁴⁶

The accident photograph collection also contained examples of fatalities, though the majority of the photographs were impossible to interpret. It was clear that they had originally accompanied accident reports, but these were not held by the RDL. In a few cases, where the name of the deceased and the exact date of death were annotated on the photograph, the death certificate was obtained. One example is the death of E Somerford, skilled labourer, onboard HMS *Kent* in 1964. The photograph (figure 3.7) shows a 5 ton

²⁴³ Lewing *Recollections*, p5.

²⁴⁴ NA, ADM 269/14: Minutes of the 68th Meeting of the Departmental Industrial Whitley Committee held at 9.30am on Thursday, 3rd May, 1956, in Suptg. Civil Engineer's Board Room, p2.

²⁴⁵ NA, ADM 269/26: Draft findings and recommendations.

²⁴⁶ ADM 269/14: Minutes of the 70th Meeting of the Departmental Industrial Whitley Committee held at 9.30am on Thursday, 28th June 1956, in Suptg. Civil Engineer's Board Room, p2.

load suspended over the deck, while the death certificate records cerebral laceration and haemorrhage due to fracture of the skull. Without any other major injury to the body, this suggests that the man's head was struck or trapped by the load. Another case involved electrical fitter F J Williams, who died of severe burns after an accident in the "G" sub-station in 1971. The photograph (figure 3.8) and death certificate suggest that the victim suffered electrical shock and burns.

There were a number of major incidents that served to demonstrate just how dangerous working in a Dockyard could be. Four such incidents are detailed below and while the first miraculously claimed no lives, it nonetheless illustrates the power and size of the equipment that workers used every day and how much damage could be done.

Exploding Steam Crane 1966

On 4 July 1966 the vertical cross tube boiler of one of the Dockyard's 5 ton steam cranes exploded. The boiler was torn away from its fittings and launched into the air. It finally came to rest nearly 200 feet away.²⁴⁷ (Figure 3.5a shows the crane after the explosion, while 3.5b shows a similar crane intact.) Fortunately no-one was injured. The incident did, however, make the front page of the local newspaper and is recalled by many former Dockyard workers.²⁴⁸

The crane's boiler had been subjected to a water pressure test six months previously. At this time there were no fitters available and the boiler was left completely full of water and with a GAG on the safety valves.²⁴⁹ It remained in this condition until two weeks before the explosion, due to a delay in the supply of required fittings. When the fittings arrived, work started on fitting a safe load indicating device. The work was completed shortly after 10 am on 4 July and it was agreed, by the chargeman of crane drivers and the fitter who had worked on the crane, that steam should be raised so that any defects could be identified and put right before the crane was put back into service. The chargeman and fitter left this task to the crane driver, who possessed a crane driving

²⁴⁷ RDL, 2010-0075-09: Report of Inquiry into Explosion, of Vertical Cross Tube Boiler in 5 ton Travelling Crane, Yard No 50, p2.

²⁴⁸ *Chatham Standard* 5 July 1966, p1; J. Stanton *The Last Cast Off: A Dockyard Community Remembers* (AIM Publications: Gillingham, Kent, 1990), p17.

²⁴⁹ This was referred to as Water Wedged or WW condition and was done to minimise corrosion inside the boiler. A GAG (not an acronym) was placed on the safety valve of a boiler to stop it letting off steam when maximum pressure was exceeded. This was done to allow full water pressure tests to be undertaken.

qualification and had driven the crane for three years and was thus considered well-equipped for the task. The boiler was lit and despite noting that one of the pressure gauges was not working, the driver left at 12 noon to have lunch in his rest room, 60 yards away, while the boiler got up steam. At 12.30pm he returned to the crane after a report that the air cock was blowing. He shut the air cock and observed that the pressure on the one working gauge was 5lbs psi and that the water in the boiler was about an inch from the top of the gauge glass, which was all quite usual. He then returned to his lunch. At 12.36pm he returned to the crane and observed that everything still appeared to be normal. He then left the crane to fetch a pair of gloves and was just 40 yards away when the explosion occurred.²⁵⁰

The Board of Inquiry into the incident unsurprisingly found that boiler was ‘shorter of water than is normal and that a rapid rise of pressure to an excessive amount associated with a local rise in temperature of the firebox wall was responsible for the rupture of the firebox and consequent explosion of the boiler’.²⁵¹ The standing orders recommended by the Board hint at some underlying issues with the way that the work was carried out:

1. Before raising steam for the first time in a pressure vessel after WW test or the refit of boiler mountings, a water pressure test at working pressure shall be applied to check the absence of leaks and the correct functioning of Safety Valve hand easing gear.
2. Check off lists should be prominently displayed giving detailed instructions for raising steam and the drill for ‘proving’ gauge glasses.
3. A responsible officer of the maintenance section is invariably to be present during the above tests who must also ensure that all safety requirements are met during the evolution of raising steam for the first time after refit.
4. This responsible officer shall also be present during the subsequent floating and setting of safety valves. He shall then present a certificate to the Utilities Section stating that the boiler is ready for service.

²⁵⁰ *Report of Inquiry into Explosion*, p3.

²⁵¹ *Report of Inquiry into Explosion*, p5.

5. The practice of ‘holding the steam back’ by opening the firing door when the draught plate is shut should be discouraged as it produces unequal heating of the firebox and thus tends to impose undue strains on the boiler.

Little is made of the fact that the GAG was still in place when the boiler exploded. The report states that the GAG was found within a few feet of the crater left by the boiler and that there was evidence to suggest that it was likely that it was not removed from the boiler after it was tested in February 1966.²⁵² The report fails to mention that if the GAG had been removed and the safety valve had been fully operational it is unlikely that the explosion would have occurred, as the excess steam would have escaped from the boiler. Complacency and reliance on previous practice in the absence of safe procedures combined with a lack of supervision or the involvement of the fitter also contributed to this accident. The driver was trusted because of his qualification and experience with the crane and therefore no charginan was present. The driver followed the usual routine with the boiler and everything appeared to be running as normal; he did not know that the GAG was still in place and though it is tempting to question why he did not check, in the era of strict demarcation of work this would have been the responsibility of a fitter rather than a driver.²⁵³

HMS *Truculent* Disaster 1950

Workers were not only subjected to hazardous conditions while within the Dockyard walls; they were often required to be aboard ships and submarines while post-refit/repair trials were undertaken and this work brought its own risks.

On 12 January 1950, the T-Class submarine HMS *Truculent* was proceeding along the River Thames towards Sheerness after a day of post-refit trials when she collided with the Swedish tanker *Divina*; 18 Chatham Dockyard workers were aboard at the time. The Commanding Officer, Lieutenant C P Bowers and five other men were on the bridge when

²⁵²RDL, 2010-0075-09: Report of Inquiry into Explosion, of Vertical Cross Tube Boiler in 5 ton Travelling Crane, Yard No 50, p4.

²⁵³ The Oxford English Dictionary defines demarcation disputes as follows: ‘demarcation dispute, demarcation rule, etc., in reference to the precise scope and kind of work laid down by trade unions for their members in their rules, a dispute occurring between two unions where such rules appear to conflict’. Between 1959 and 1965, 15% of all work stoppages due to demarcation disputes occurred in the shipbuilding and marine engineering industry (J.F.B. Goodman ‘Strikes in the United Kingdom: Recent Statistics and Trends’ in E.W. Evans and S.W. Creigh (eds) *Industrial Conflict in Britain*.(London: Frank Cass), p72).

the collision occurred. Bowers had given the order for the men to return to their stations below, but only the lookout rating was able to obey this command; the others were thrown clear of the submarine.²⁵⁴ It was an hour before they were rescued by the Dutch vessel *Almdyk* and in the meantime the remainder of the crew and Dockyard men were trapped aboard. Bowers had also given the order to close the watertight doors, but this was only possible from as far aft as the engine room and as a result the fore end of the submarine flooded very rapidly.²⁵⁵ Ten men died as a result of the initial flooding and the remaining 64 retreated to the engine room under the command of First Lieutenant, F J Hindes. Having heard propellers overhead and believing that this indicated that rescue vessels were approaching, the men split into two groups to escape from the stricken submarine; the first group escaped aft while the second escaped from the engine room. There were not enough Davis Submarine Escape Apparatus (DSEA) sets to go around,²⁵⁶ but despite this the escape was executed faultlessly (reinforcing Captain Ruck-Keene's theory that escape without any apparatus was possible and that submariners should be trained accordingly). When the men surfaced, however, they were entirely alone in the dark, freezing water. Rather than rescue vessels the crew had merely heard the sound of routine river traffic and over the ensuing hours all but ten of the escapees were carried out to sea by the ebbing tide and perished.²⁵⁷ The swift escape was prompted by fears of CO₂ building up within the submarine, due to half of the submarine being flooded and the extra 18 personnel from the Dockyard aboard. Hindes was aware that when HMS *Thetis* was lost, in 1939, 99 men had died from CO₂ poisoning, because they had waited too long to escape.²⁵⁸ As mentioned, he had also expected to emerge and see rescue vessels.

It was some time before the Captain of the *Divina* realised that it was not a small craft that he had sunk, but a large submarine with many men still inside. He made efforts to initiate a rescue, but was hampered by the fact that he could not contact the shore with his

²⁵⁴ NA, ADM 1/22713: Loss of the HMS *Truculent*: Admiralty Statement, p1.

²⁵⁵ ADM 1/22713: Loss of the HMS *Truculent*, p1.

²⁵⁶ DSEA sets were provided for the whole of the submarine's company, but were equally spaced along the vessel rendering many of them unavailable when the fore sections flooded.

²⁵⁷ P. J. Kemp *The T-Class Submarine: The Classic British Design* (London: Arms and Armour Press, 1990), pp112-4.

²⁵⁸ Kemp *The T-Class Submarine*, p110.

radio.²⁵⁹ In fact, the first signal was sent by the *Almdyk* at 19:49, some 45 minutes after the initial collision and this only reported that she was picking up men from the water. The vessel sent a second signal at 20:15 reporting the loss of the submarine. The crew of the *Almdyk* did what they could, but it was a deep hulled vessel operating in tidal river water. Over an hour later the first naval vessel, HMS *Cowdray*, arrived at the scene. She was followed by HMS *Cadmus*, the Trinity House Vessel *Alert* and the Margate and Southend lifeboats.²⁶⁰ Survivor Dennis Griffiths, then a 22 year old fitter, recalled:

‘I was the last, but one, to go out of the escape hatch ... Getting up to the surface was just a matter of taking a deep breath and waiting to reach the top. Then came the worst – waiting for two hours until being picked up. I could hear voices in the darkness, but couldn’t see anybody’.²⁶¹

An inquiry found fault in the actions of both vessels, but concluded that Bowers’ decision to turn to port when he realised that he was on a collision course with *Divina*, was in contravention of both sound seamanship and the ‘Rule of the Road’ and that this initiated the train of events that led to the collision.²⁶² The inquiry also suggested that had more been known about air-quality and safe escape times, that the decision to evacuate may have been delayed until the naval rescue vessels had arrived and many more lives could have been saved.²⁶³

Austerity in the post-war years meant that the expensive recommendations of the Ruck-Keene report were slow to be introduced.²⁶⁴ The loss of the *Truculent* galvanised the Navy into action and the following improvements were made in terms of submarine escape methods:

1. Production of immersion suits was accelerated;
2. Built In Breathing Systems (BIBS) were fitted to all submarines;

²⁵⁹ ADM 1/22713: Loss of the HMS *Truculent*, p2.

²⁶⁰ ADM 1/22713: Loss of the HMS *Truculent*, p2.

²⁶¹ RDL Ref: 2011-0559-3 Article: T. Pearce ‘Subsmash!’ (date and publication unknown), pM13

²⁶² ADM 1/22713 Report on the loss of HMS *Truculent* 23 January 1950, p4.

²⁶³ ADM 1/22713 Report on the loss of HMS *Truculent* 23 January 1950, p9.

²⁶⁴ The policy regarding escape from submarines had been reviewed after the loss of HMS *Poseidon* in 1931 and HMS *M2* in 1932. After the Second World War a committee was established with Captain Philip Ruck-Keene as chair to investigate all aspects of submarine escape. For more on escape from submarines and the Ruck-Keene report, see Kemp *The T-Class Submarine*, pp105-117.

3. The T-class submarines were fitted with a compartment at each end containing an escape hatch and equipment, including immersion suits for each man onboard plus one-third extra; the conning tower was fitted for escape and indicator buoys, underwater telephones and signal ejectors were provided.

Chatham Dockyard was actually tasked with building an escape tower. Cedric Salmon, who entered the Dockyard as a shipwright in 1944 and later moved into the Drawing Office, recalled being involved with this project:

But one interesting project I had, I got involved with the submarine escape system down at Gosport and they were experimenting for free escape from the normal [continental] shelf which was about 500 feet deep and I had the task of designing a submarine escape tower to hold one person which would take those pressures and they would pressurise him in 45 seconds and decompress him in 15 and that was really something to go through to that sort of pressure 500 feet of pressure that's about 250 pounds per square inch. And in fact I had the job of actually building this and when it was completed I was invited down there to see it and actually see one of our Instructors go in and do that escape and come out of it.²⁶⁵

No 3 Dock Disaster 1954

On 15 December 1954 the caisson in No 3 Dock, which was housing the T-class submarine HMS *Talent*, became buoyant and let water into the dock. The submarine was consequently swept from the dock and across the River Medway, onto the opposite bank at Whitewall Creek. When the submarine left the dock there were 50 men aboard; 29 were injured and four were killed: Henry Brooker, a welder; Stuart Twist, a shipwright; Reginald Fisher, an engine fitter and William Ryan, a skilled labourer.

One of the many eye witnesses to the incident, Alan Rayner, then a shipwright apprentice, recalled:

The noise was like thunder, the caisson hit the stern of *Talent* rolling round and then hurtled up the north side of the dock, the *Talent* lurched and rolled as the wave shot up the dock lifting the submarine almost slowly at first, then it shot out the dock and into the river. Shores, brows, wooden dock blocks rushed around as if in a whirlpool at the head of the dock, all this in a matter of seconds.²⁶⁶

²⁶⁵ G2003/2.

²⁶⁶ A. Rayner 'H.M.S *Talent* Disaster 1954: An Eyewitness Account' *CHIPS* (newsletter of the Chatham Dockyard Historical Society) Summer 2008, p14.

The cause of the incident was a clear lack of management and planning. The Caisson Section had prepared the caisson to have 150ft of decking repaired and to have new flood plates fitted (see figure 3.4 for a drawing of the caisson). Working purely on previous experiences (i.e. no calculations were performed in accordance with the day's tide predictions), the Caisson Team added water to the air chamber, up to the level of the sluice culvert, drained the water from the sinking tank and plugged the caisson's 17 holes. This action was taken so that shipwrights could enter the caisson to carry out the work, but meant that the holes could not counteract buoyancy as they should. The same had been done the preceding June on the caisson of No 2 dock without event, though this was the only other occasion in living memory that it had been done. On 15 December there was an unusually high tide, which rendered the caisson buoyant and allowed water to enter the dock. As the Admiralty's inquiry later confirmed, the amount of water added to the air chamber was vastly insufficient for both caissons 2 and 3.²⁶⁷

The management failures in this case became apparent during the Admiralty's inquiry. G C B Dodds, head of Naval Law Branch, acknowledged the difficulty in apportioning blame, but went on to name the two men who undertook the tasks to prepare the caisson for repair as the 'prime movers'.²⁶⁸ It is clear from the documents, however, that the men had merely repeated operations that they believed to be safe and that their work had been inspected by their chargehand before the disaster occurred and he did not require any additional water to be added. Dodds observed that 'The higher authorities in the Dockyard did not appear to have been concerned in the particular operations of the caisson at all.'²⁶⁹ The Admiralty's Board of Inquiry, presided over by William Perrett, deputy superintendent (industrial) of Chatham Dockyard, concluded:

The Board considers there was inadequate control and supervision of the caisson section, and have held inspector of shipwrights, Mr Stanley and the chageman of shipwrights, Mr Townley, to be responsible for the accident. The Board have made certain recommendations to safeguard against a repetition of the accident, apart

²⁶⁷ RDL Ref: 2011-0560-2 Extract from Hansard 26 January 1955 "HMS Submarine "Talent" (Accident), p1.

²⁶⁸ NA, TS 57/2 Inquest: Disaster to HMS "Talent" at Chatham Dockyard on 15 December 1954 involving four deaths, letter from GCB Dodds, head of Naval Law Branch to S G Gains, Treasury Solicitor's Office, dated 7 February 1955.

²⁶⁹ NA, TS 57/2 Inquest: Disaster to HMS "Talent" at Chatham Dockyard on 15 December 1954 involving four deaths.

from the technical aspect. Their recommendation is for tighter control and adequate training.²⁷⁰

It seems that the confusion and lack of communication continued in the weeks following the disaster. The Constructive Department manager attended as an extra 20 tons of ballast water was added to the caissons at No 2 Dock and No 4 Dock, as a temporary safety measure. The inspector of shipwrights, Mr Stanley, having no knowledge that this had already been done, had a further 20 tons of water added to each caisson. Fortunately the Constructive Department manager became aware that the duplication of effort had occurred and further disaster, from excess weight on the foundations of the caissons, was averted by removing the extra ballast. The Constructive Department manager removed Mr Stanley from work on caissons immediately, stating in a memorandum to the Admiral Superintendent of the Dockyard:

Whilst it is probable that Mr Stanley was acting under stress of the previous disaster I felt there was no option but to take him off caissons forthwith ...²⁷¹

The salvage operation presented further hazards. The Kent Fire Brigade came to assist in the salvage of the submarine, providing pumps to remove water from the vessel. A thick fog had descended by the time the launches had despatched from the Dockyard reducing visibility to zero and this was accompanied by a strong tide:

... the only means of locating the stranded vessel was to steer for the sound made by the men on board hammering the hull.²⁷²

When the firemen arrived they had to man-handle the pumps across a ten-yard strip of deep mud, left by the falling tide, using planks. They then had to hoist the pumps onto the vessel, along sides and deck covered in oil and slime and 'festooned with wires, cables and shoring timbers'. The crew worked all night, but when their homeward launch departed, it became lost in the fog and grounded. The exhausted firemen waded through water and

²⁷⁰ NA, ADM 1/25305 No 3 Dock Caisson at Chatham Dockyard – failure of on 15th December 1954. Note to Parliamentary Secretary accompanying papers regarding the accident. Dated 13th January 1955.

²⁷¹ NA, ADM 1/25305: Memorandum from the Manager, Constructive Department to AS Chatham12 January, 1955

²⁷² H. Klopper *To Fire Committed: The History of Fire-Fighting in Kent* (Kent: The Kent Council of Fire Services National Benevolent Fund, 1984), p173.

mud, finding themselves back at the submarine again where they remained until the fog cleared.²⁷³

Shortly after the disaster had occurred, a diving operation was set up to discover whether the caisson was lying hard on the dock bottom before any further recovery could be undertaken. Desmond Brown, a shipwright diver, was the man despatched to the job. He recalled:

All the diving gear, helmet, weights and boots etc had been assembled on the dock steps close to the water. As I dressed I could not take my eyes off the caisson and the way she was leaning over. Not too much but enough to present a real danger with the tide on the turn. Any movement in the water may cause the caisson to lurch even further over. Bill Fletcher [fellow diver] had in the meantime boarded the caisson (a brave act in the circumstances) and rigged a shot rope from the caisson to the dock bottom. Divers always descend on a shot rope to control the speed of their descent.²⁷⁴

When he had descended to the bottom, Brown found that the oak blocks, which were chained together, were buoyant and were swirling about him. His training assisted him to keep calm:

In a ticklish situation you are trained never to panic or to work too hard underwater because you produce more CO₂ than the air you receive. You wait until the position you are in is completely hopeless ... then you panic!!²⁷⁵

Fortunately Brown located the caisson and confirmed that it was secure on the dock bottom before returning to the safety of the dock side, once again passing through the hazardous buoyant blocks. Diving operations continued during the following weeks, beginning with a search for bodies and finally salvaging and replacing the caisson.

Fire in No 2 Slipway 1966

Fire broke-out in the eighteenth-century covered slip on 12 July 1966 and was caused by an apprentice, who was subsequently discharged.²⁷⁶ The apprentice was one of a small team

²⁷³ Klopper, H *To Fire Committed*, p173.

²⁷⁴ D. Brown 'No 3 Dock Disaster' *CHIPS* Spring 2008, p10.

²⁷⁵ Brown 'No 3 Dock Disaster', p10.

²⁷⁶ Hansard (Commons) *Chatham Dockyard (Fire) 27 January 1967 vol 739 cc379-80W* and *Chatham Dockyard (Fire) 20 January 1967 vol 739 cc159-60W*.

sent to fetch folding tables from the slipway. He and another apprentice took a cigarette break in a crate inside the slipway, sitting on hessian sacks. They claimed they had not seen the signs prohibiting smoking outside the slipway. The first apprentice started to light the corners of a hessian sack with matches and then stubbing out the lit areas to impress his colleague. Though he had initially been able to extinguish the flames, a fire took hold and he was powerless to stop it. The slipway was full of combustible stores and had its original timber covering, which contributed to the fire taking hold so completely.²⁷⁷

The intense heat from the fire made it impossible for the 16 local fire crews fighting the blaze to save the building. Some 41 people were injured while fighting the blaze and these included fire fighters and Dockyard workers. Many of the cars parked nearby were destroyed and a machine shop was damaged. Pamela Chuck and 23 of her female colleagues from the Naval Stores Department in the Dockyard were moved to write a letter of admiration and thanks to the Chief Fire Officer, stating that as they were too young to recall the Second World War, the fire:

...was the worst we have ever seen. Of course, we realise that these men possess a special quality, but to see them tackle the blaze really brought home to us your men's dedication to duty. The heat was so intense that I'm sure some of the men must have sustained burns but nevertheless they carried on regardless ...²⁷⁸

After several requests from MP for Gillingham, Sir Frederick Burden, the Secretary of State for Defence, Maurice Foley, made a statement regarding the fire in the House of Commons in January 1967:

The Board of Inquiry concluded that the fire started as a result of the action of an employee who has since been discharged. It spread very rapidly, partly because of the explosion of wood and other dust which has accumulated in the wood members over centuries, and partly because the open-ended structure of the building formed a natural wind tunnel which drove the fire its whole length. As a result of the fire, the building and its contents were completely destroyed. As previously stated, 41 people received minor injuries. The total loss is estimated at about £80,000.²⁷⁹

²⁷⁷ RDL, 2010-0075-08: Report of a Board of Inquiry held at H. M. Dockyard, Chatham into the Fire at No. 2 Slip.

²⁷⁸ P. H. Pearce and P. Masters *Fifty Vigilant Years: A History of the Kent Fire Brigade 1948 – 1998* (Snodland: Smurfit Townsend Hook, 1998), p72.

²⁷⁹ Hansard (Commons) *Chatham Dockyard (Fire) 20 January 1967*.

The instruction to collect the tables had been given by Mr Creed, group instructor chargeman at the Shipwright Apprentices Training Centre. He defended his lack of supervision by stating that he had chosen the six boys because he believed them to be reliable, trustworthy and well acquainted with No 2 Slipway, as they had worked there previously. 'He did not think it necessary to warn the boys specifically about 'No Smoking' in the Slip since the boys normally work with timber in a timber constructed building and as such they were well aware of the danger of smoking in such an environment, as this had been impressed upon them repeatedly at the Centre'.²⁸⁰

Besides the issue of supervision, a number of problems were highlighted by the fire, such as the absence of prominently displayed no smoking signs; inadequacy of fire fighting arrangements in a building with a high fire risk; and the absence of a fire alarm and fire fighting equipment. In fact the Board of Inquiry's report stated that:

... in view of the unique fire risk represented by a building constructed entirely from timber rendered highly combustible by time over the last 266 years, the Board were appalled at the lack of fire detection devices and back up fire fighting facilities such as internal hydrants and pre-rigged hoses or hose reels as fitted in other buildings in the Yard with comparable or lower fire risk.²⁸¹

Conclusion

This chapter established the dangers inherent in the Dockyard working environment. The causes of the major accidents and incidents detailed herein can be summarised into a few causal factors. Firstly, lack of supervision and poor management decisions were evident in all five examples. In the cases of the boiler explosion and the caisson failure, this was combined with complacency and an unquestioning reliance on previous practice. The latter two factors can be extrapolated to include reliance on others to perform tasks. This is evident in the boiler explosion case, where the driver failed to check the boiler over thoroughly before firing it up, believing that to be a fitter's job; a decision that very nearly cost him his life. This behaviour pattern can only have been encouraged by the spectre of the demarcation dispute. The caisson failure suggested a serious lack of knowledge and misplaced confidence in previous practices that were not routinely performed. Lack of appreciation of danger and knowledge gaps were apparent in all of the examples too.

²⁸⁰ Report of a Board of Inquiry held at H. M. Dockyard, Chatham into the Fire at No. 2 Slip, p6.

²⁸¹ Report of a Board of Inquiry held at H. M. Dockyard, Chatham into the Fire at No. 2 Slip, p4.

Lieutenant Bowers' contravention of seamanship and the Rule of the Road provided a pertinent demonstration. This case also revealed that austerity measures had prevented the introduction of escape procedures that may have saved the lives of the men aboard the *Talent*. Further examples that demonstrated that workers' (and naval personnel's) safety was not always the first priority were uncovered in the research for chapter 6. Finally, the fire at no 2 slipway provided an example of masculine behaviour, in this case trying to gain respect from colleagues by acting in a reckless manner. Masculinity is dealt with in the following chapter and the behaviours that it sometimes encouraged and which put workers in danger can be grouped within a category of health and safety issues that are familiar to today's occupational safety officers as 'human factors'. Indeed, the initial effort to reduce accidents in industry in the 1930s and 1940s was based on engineering modifications that made both the environment and tasks less hazardous. From the 1950s the progress slowed and latterly attention started to be paid to the impact of worker behaviour on safety.

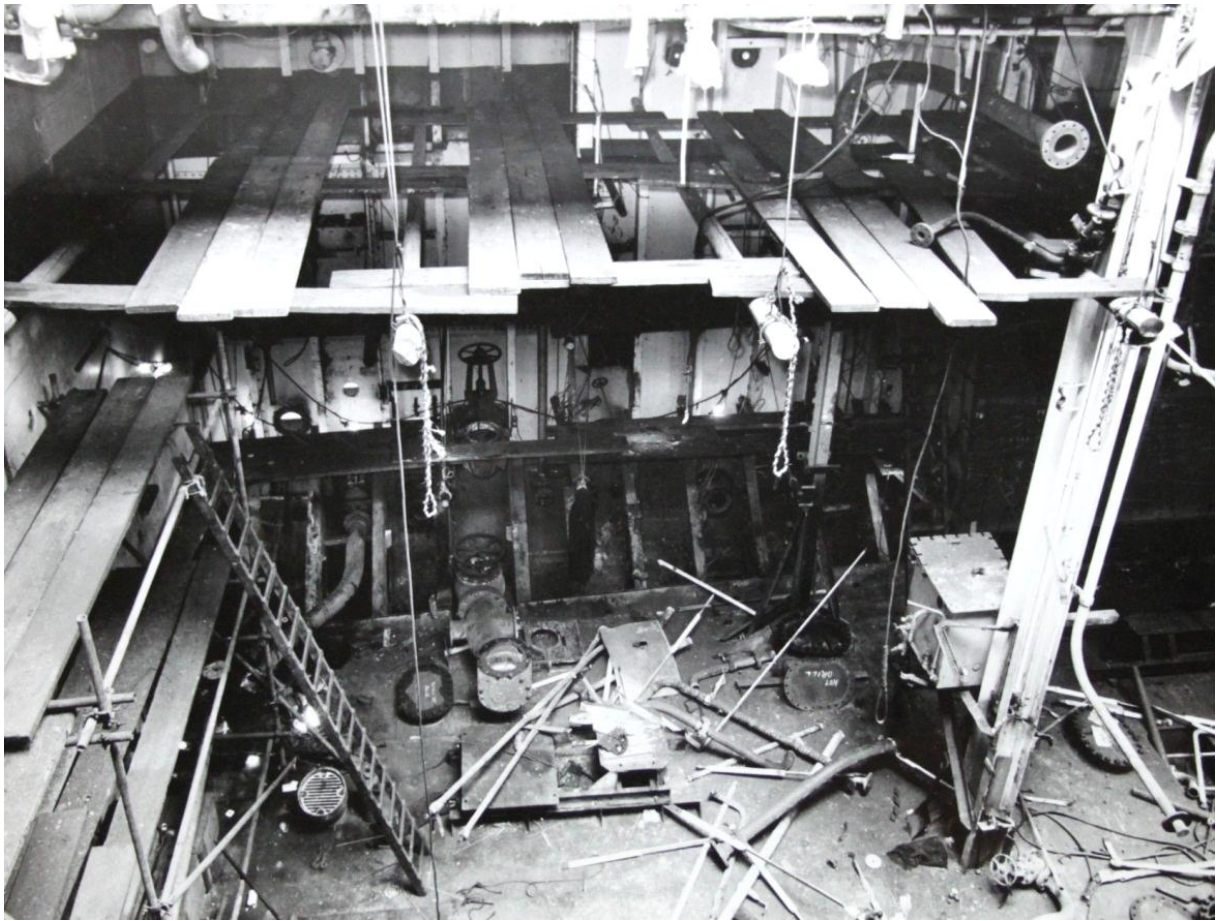


Figure 3.1: This photograph was taken aboard the repair ship HMS *Berry Head* in 1961, after a burner fell from the scaffolding on 24 June 1961. As with the majority of photographs in this collection, there was no description of the accident, so it is impossible to know where the burner fell from. The debris on the floor in the centre of the photograph suggests collapsed staging, but this could merely be an untidy work area and this is further suggested by the pipes and cables in the bottom right corner. There are no scaffolding boards on the floor, so the gaps in the scaffolding at the top of the image were presumably there to start with. The ladder gives an idea of scale.

Source: RDL Accident Photographs Collection (black and white).

The following photographs illustrate just how confined the working spaces aboard ship could be.

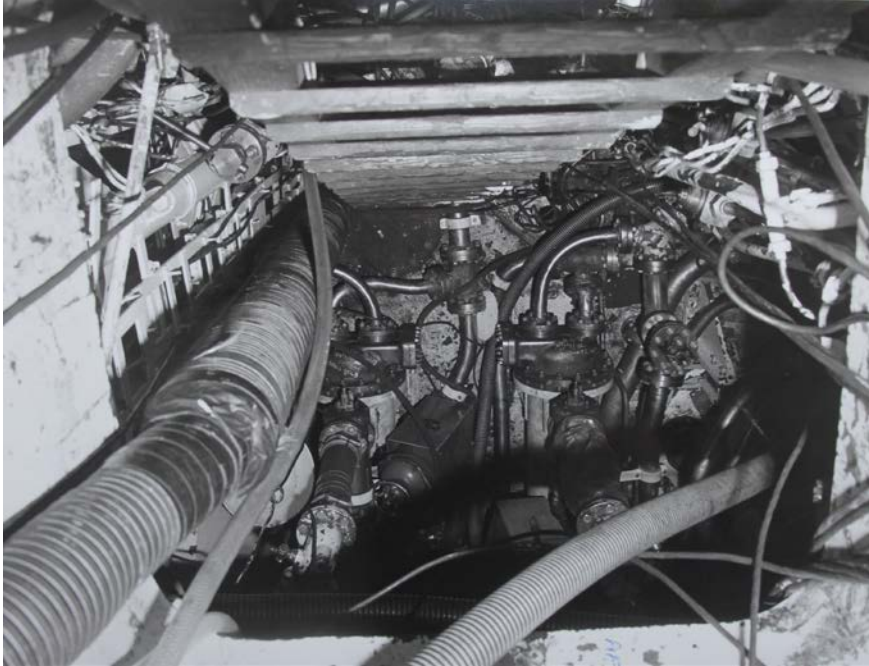


Figure 3.2a: HMS *Warspite*'s turbo generator room, looking down across hatch. Note the ladder at the top of the photograph and lack of floor space on which to stand.

Ref: RDL 2007.0091.06 PHA 15861

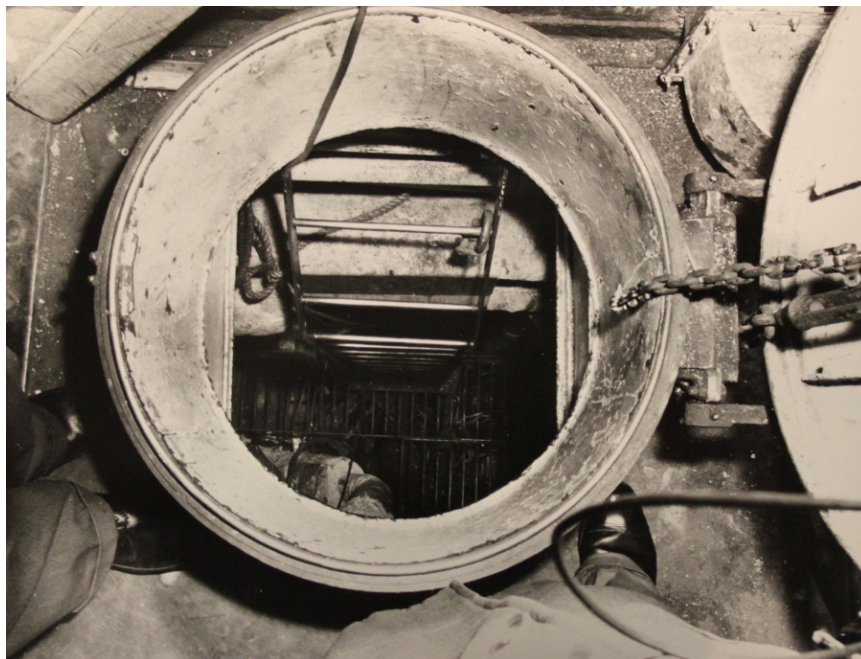


Figure 3.2b: Boiler room of Battle Class Destroyer HMS *Aisne*. The small size of the entrance to the hatch is highlighted by the workers' feet at the bottom of the photograph and by the proximity of the ladder.

Ref: RDL Accident Photograph Collection

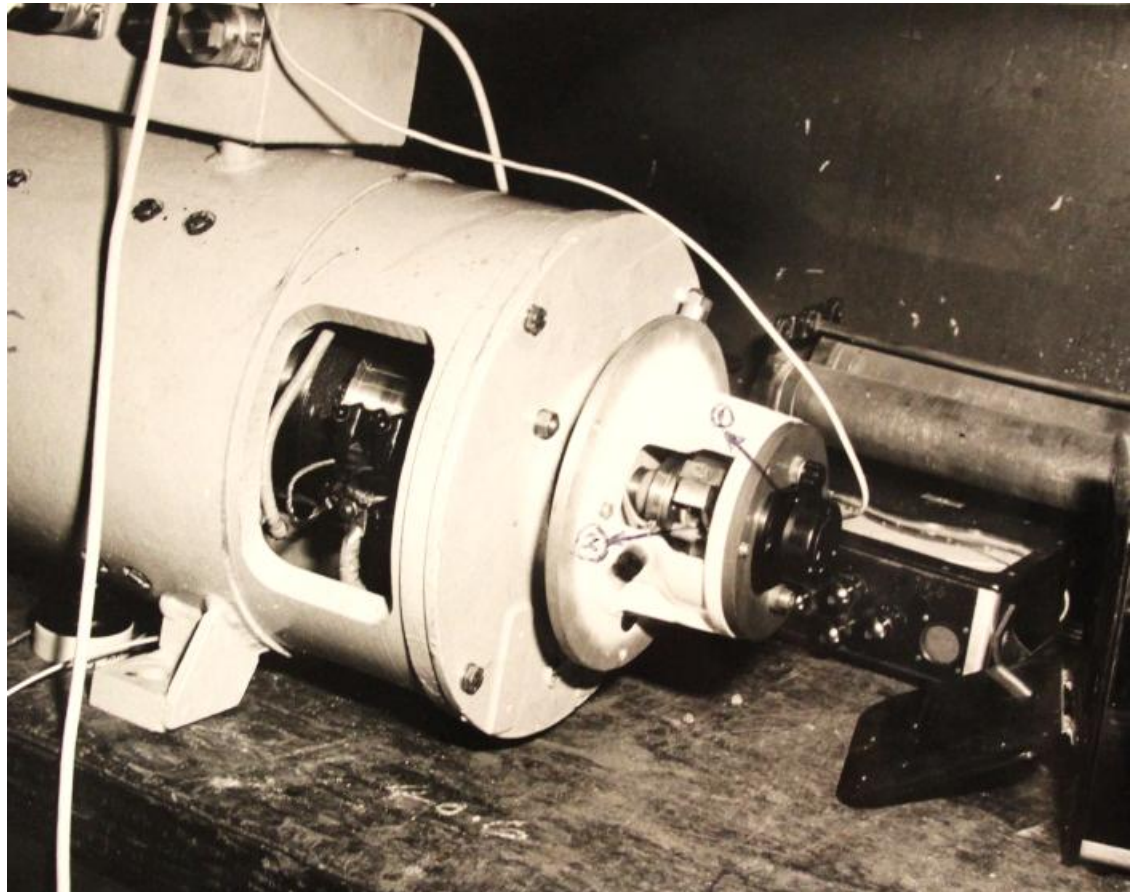


Figure 3.3 T. Mitchell, electrical fitter, injured a finger in this generator, after a colleague failed to replace the safety cap. The numbers were added in pen to the photograph and correspond to notes on the reverse, telling us that Mitchell was attempting to reach the control knob (1) and caught his finger (2) while the rotor was revving at 2400 rpm. Taken in 1969.

Source: RDL Accident Photographs Collection (black and white).

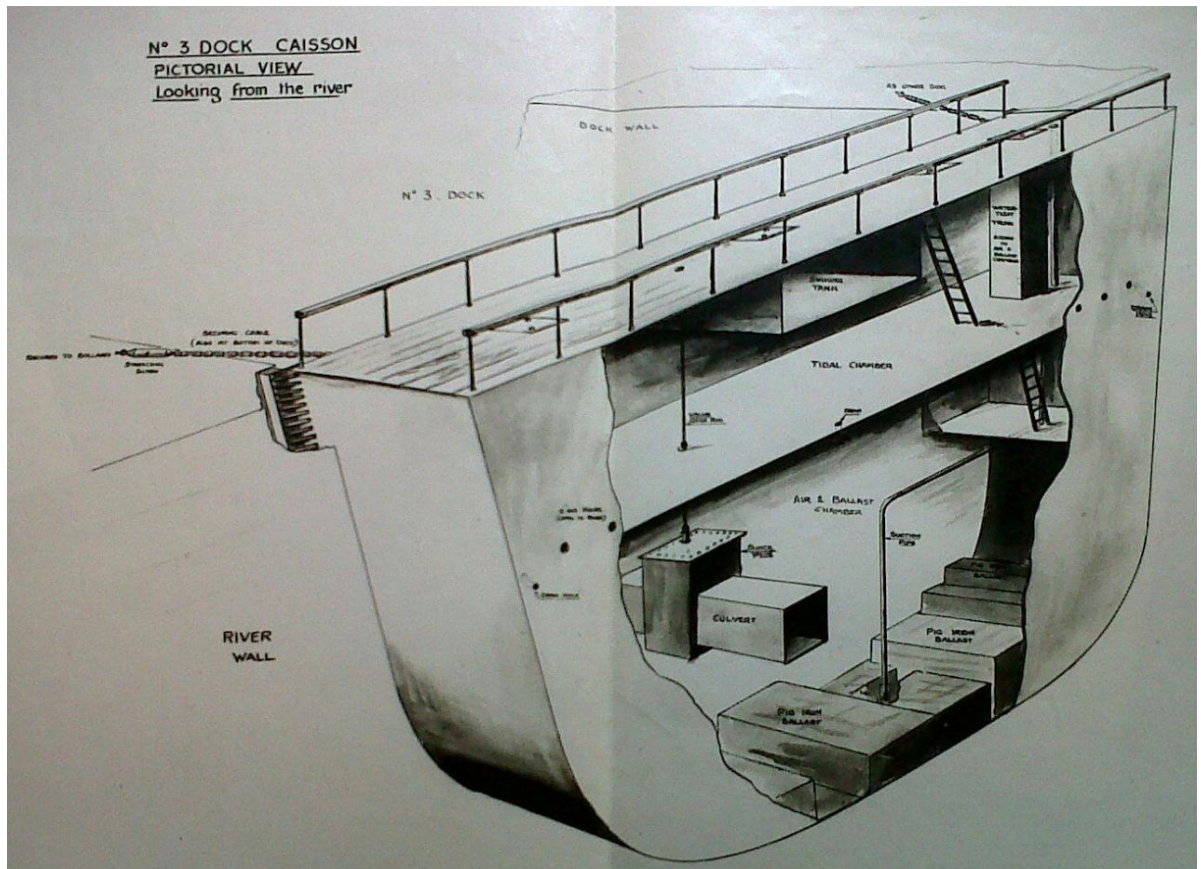


Figure 3.4 Illustration showing the inside of Caisson No 3. The ladders in the sketch give an idea of scale while the notations show where the caisson was located and explain the chambers and equipment inside.

Source: RDL Ref: 2011-0560-2 (pen and ink drawing, black and white).



Figure 3.5a Travelling steam crane after the explosion of its vertical cross tube boiler on 4 July 1966. The corrugated iron that has been torn apart would have formed the cabin for the crane driver (see figure 3.5b below) and would also have housed the boiler. Source: RDL Accident Photograph Collection (black and white).



Figure 3.5b This image has been included to show what the crane in figure 3.5a would have looked like before the explosion. The photograph was taken in 1973 in connection to the accident that befell Groombridge (figure 3.9). Source: RDL Accident Photograph Collection (black and white).

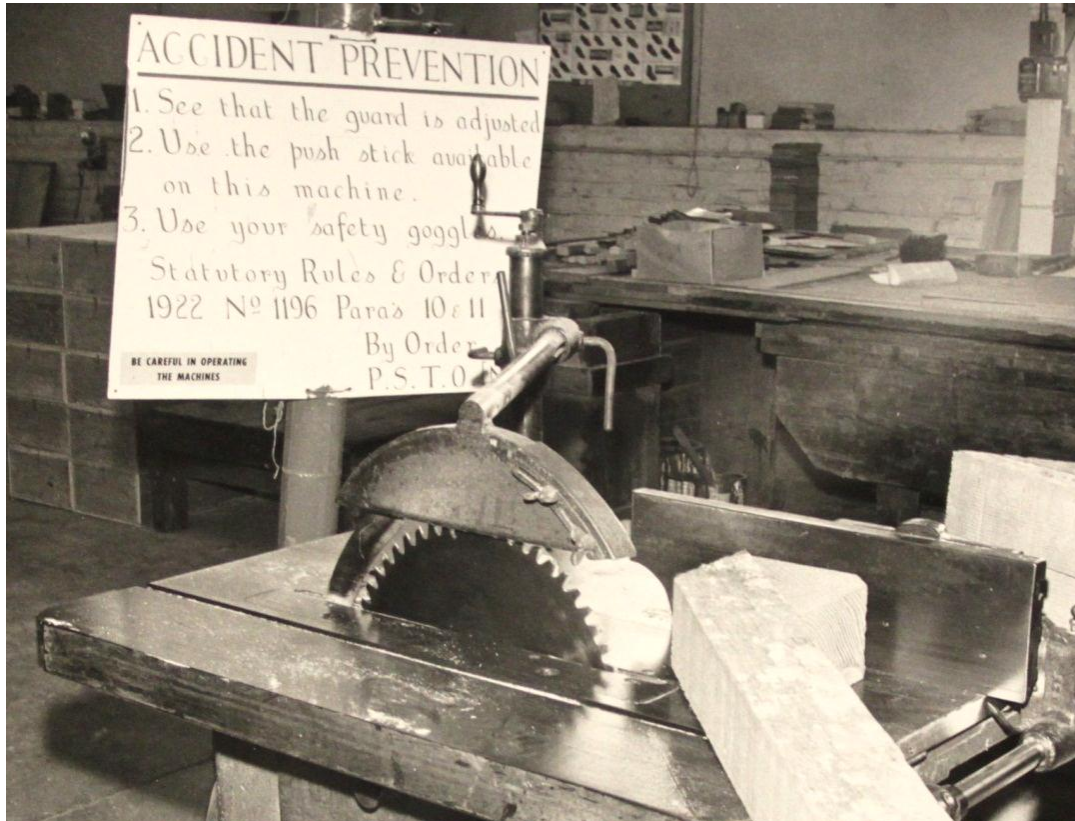


Figure 3.6: Safety notice regarding the use of guards, push sticks and goggles. Statutory Rules & Orders predated Statutory Instruments in the UK legislative system. No 1196 referred to the Woodworking Machinery Regulations, 1922, which were revoked by the Woodworking Regulations, 1974. Taken in November 1973.

Source: RDL Accident Photograph Collection (black and white).

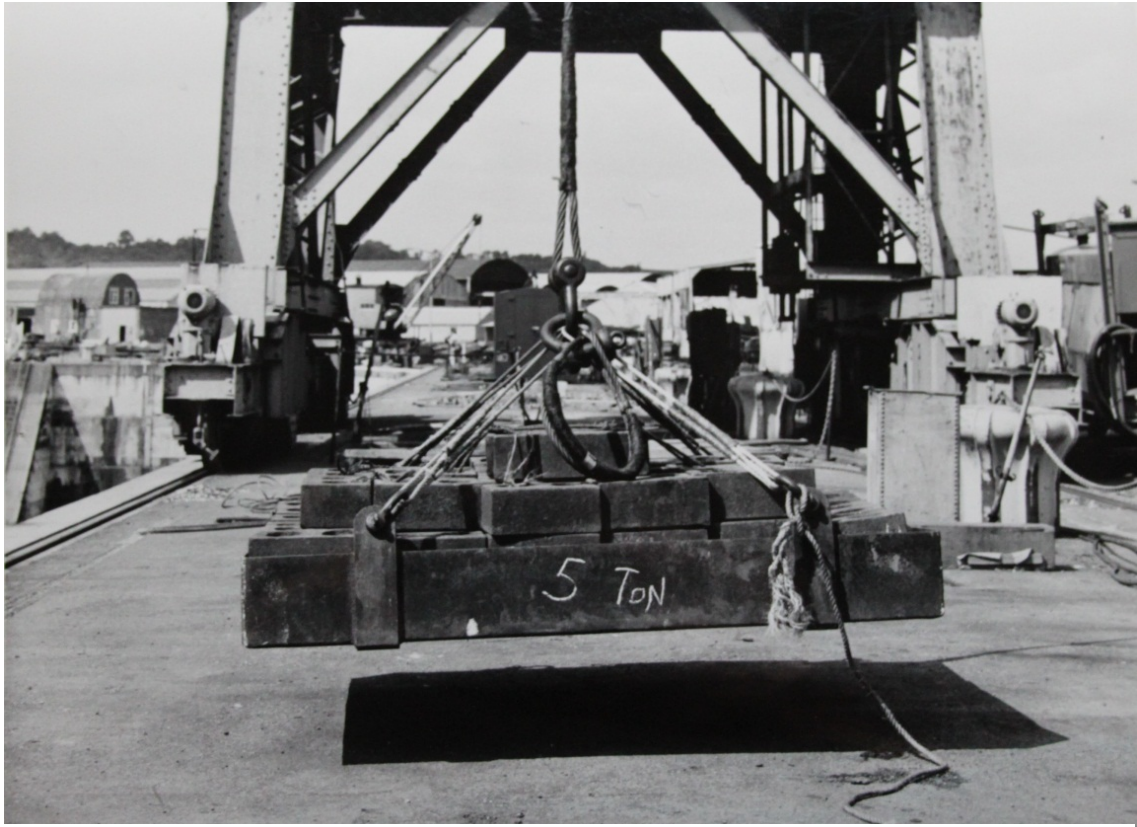


Figure 3.7: Crane holding five ton load. This photograph was taken after the death of skilled labourer E. Somerford aboard HMS *Kent*. The details of the accident were not noted on the photograph, but Somerford's death was caused by head injuries, suggesting that the load struck him.

Source: RDL Accident Photograph Collection (black and white).

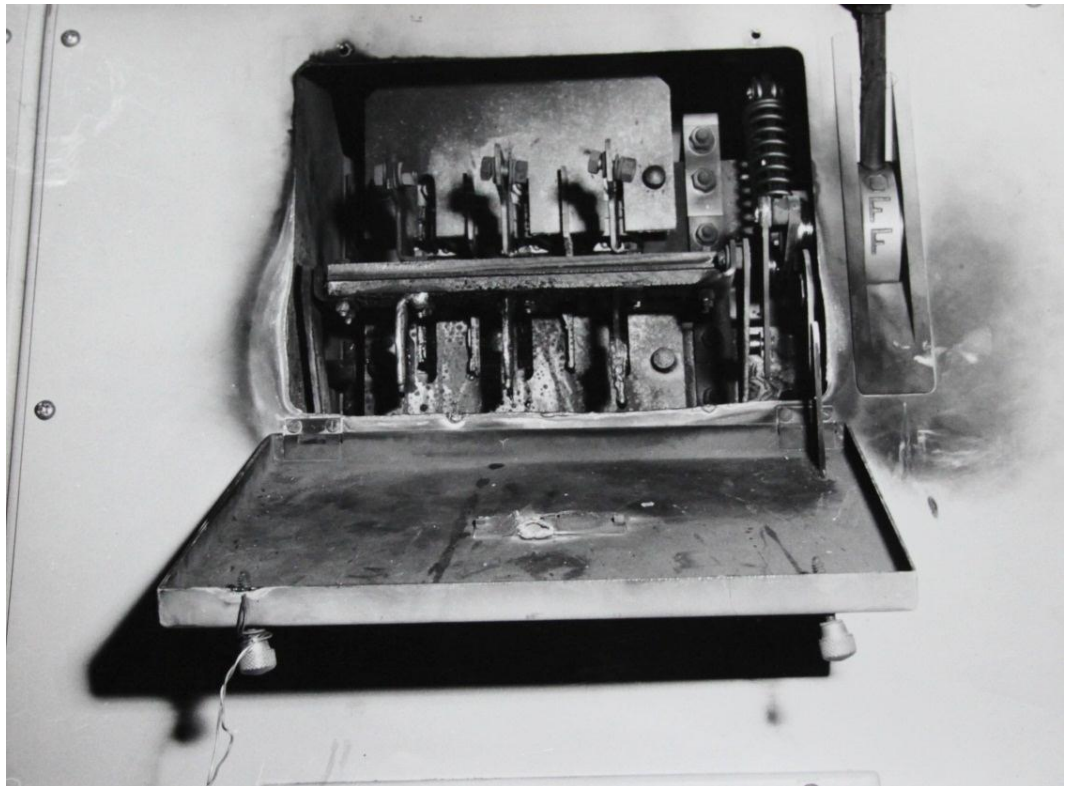


Figure 3.8: This photograph was taken on 24 June 1971 after the death of electrical fitter F. J. Williams and clearly shows the damage caused by the electrical fire that was the cause of death. "G" Sub Station.
Source: RDL Accident Photograph Collection (black and white).



Figure 3.9: Injury to worker named Groombridge in 1973. The annotations to the photograph were added in pen, presumably by the person investigating the accident and suggest that Groombridge was injured by the crane and that A. Palmer was a witness. The angle of the crane housing suggests that it was turning (the crane travelled on rails, visible to the right of the photograph, but also rotated). Figure 3.5b shows the crane unloading bales from the barge, which may have been raw materials for rope making. Source: RDL Accident Photograph Collection (black and white).

Table 3.1						
Comparison of accidents rates per 100k people at risk in 1973 to 1978						
(Shipbuilding and Ship Repairs National Industry Group Report 1978)						
	1973	1974	1975	1976	1977	1978
Manufacturing industry	3710	3520	2790	3480	3590	3620
Construction industry	3540	3330	3460	3530	3300	3390
Shipbuilding, ship-repair and marine engineering	6870	7010	6180	6420	5910	5620
Source: Factory Inspectorate <i>Shipbuilding and Ship-repairing Health and Safety 1971-78</i> (London: HMSO, 1980), p3.						

Table 3.2	
Frequency of accident types taken from Boilershop (1947 to 1960), Mould Loft (1977 to 1983), Plumbers Shop Hurt Books (1954 to 1971) and No 2 Smithery (1960 to 1961)	
Hernia	22
Foreign body or substance in eye(s)	32
Puncture wound or splinter	19
Injury from slipping or dropped item	80
Welders Flash	13
Fall from height/ladder/staging	20
Slip, trip or fall (including stairs)	46
Electric Shock	2
Rash, dermatitis or reaction to chemicals	11
Strain or sprain (other than hernia)	21
Injury while working with hand tool	37
Injury while working with machinery	15
Struck head	8
Injury while slinging or from object hanging from crane/traveller/hoist	10
Fall from bicycle	2
Burn/scald	20
Struck elbow	3
Trapped between objects/doors/rollers etc	7
Immersed in water (i.e. fell in dock)	1
Other or uncertain cause	102
Total	471
Source: RDL: Boilershop Hurt Note Book (D189) 1947 to 1960; National Insurance (Industrial Injuries) Act 1949 Accident Book (Form B.I.510A) Mould Loft 1977 to 1983; Minor Injury Reports Hurt Book 1954 to 1971 - Plumbers Shop; Records: Minor Accidents No 2 Smithery From 27.4.60 to 20.12.61.	

Table 3.3.	
Shipbuilding and ship-repairing. Percentage distribution of accidents by type	
	% of all accidents
Falls	
Falls on the level	23.4
Falls on or from staging	6.4
Falls through openings	2.4
Falls from ladders, stairs, gangways	8.4
Falling objects	
Objects falling on feet	6.1
Objects falling on other parts of body	3.7
Hand tools	3.0
Machinery	1.8
Lifting machinery	0.8
Lifting gear	0.8
Fire and contact with hot surfaces causing burns	3.0
Gassing	0.3
Foreign bodies and welding arcs causing eye injuries	3.0
Manual handling of objects	13.9
Working in restricted positions	3.7
Striking objects, trapping hands and feet	19.2
Miscellaneous	0.2
Source: HSE <i>Shipbuilding and Ship-repairing Health and Safety 1971-78</i> , p3.	

Chapter 4

A Culture of Danger?

The industry of creating ships for war is charged with multiple masculine identities. As an industrial process, the production of warships is as much the focus and celebration of the androcentric nature of war as the buildings, monuments and ships themselves.²⁸²

It has been established that the working environment in the Dockyards was hard and risk-laden. This is true of most industrial workplaces and the men and women who work in them are often considered to be tough and to possess strong masculine personas. There is a masculine view that hard physical work is befitting for ‘real men’. This was reflected in Hayes’ analysis of the British construction industry circa 1918, when male workers resisted the development of occupational welfare because they believed that “‘true men’ should be able to tolerate harsh working conditions’.”²⁸³ Kris Paap’s more recent experience of work in the American construction industry supports this.²⁸⁴ Paap argues further that men who undertake physical work such as construction gain more than simply economic recompense: ‘... construction work pays a *physiological and psychological* wage by making the worker look and *feel* like a man’.²⁸⁵ This chapter looks at the masculine traits of Dockyard workers, such as competition, striving to belong, camaraderie, suppression of emotion/weakness/fear, subordination of women and the role within the family (i.e. provider). It then looks at the role of masculinity in (a) the acceptance of harsh working conditions and (b) promotion of a culture of danger through unsafe practices.

While this study did not probe deeply into the psychological or sociological issues surrounding masculine culture in the Dockyards, it was necessary to become familiar with some recent discourses in the fields of gender history and men’s studies. A relatively new area of enquiry, the history of masculinity, has seen a proliferation of works that cover the impact of war on masculinity or which look at the development of masculine ideals in the

²⁸² R. Bartram and S. Shobrook ‘You have to be twice as good to be equal: ‘placing’ women in Plymouth’s Devonport Dockyard’ *Area* 30:1 (1998), p62.

²⁸³ D. Iacuone ‘“Real Men Are Tough Guys”: Hegemonic Masculinity and Safety in the Construction Industry’ *The Journal of Men’s Studies* 13:2 (2005), p247.

²⁸⁴ Paap *Working Construction*.

²⁸⁵ Paap *Working Construction*, p26.

eighteenth and nineteenth centuries, particularly among the middle classes. John Tosh's works on the development of masculinities in the nineteenth century have been useful in understanding the context for some of the behavioural traits evident among Dockyard workers in the following century.²⁸⁶ Tosh outlines the bourgeois roots of the masculinity that developed in industrialising Britain, a period which 'was clearly pivotal in entrenching an entrepreneurial, individualistic masculinity, organized around a punishing work ethic, a compensating validation of the home, and a restraint of physical aggression'.²⁸⁷ In contrast with manliness prior to this period, Victorian bourgeois masculinity covered a much broader social base. Its values were 'found equally in the lives of the schoolmaster, the mill owner, the doctor, and the tenant farmer'.²⁸⁸ Values relating to paid productive work later became the concern of the working classes, as men aimed to earn enough to support the family, so that their wives could stay at home, dedicated to domestic duties. Moreover, men were encouraged to see work as a moral duty, but also as route to personal fulfilment, identity and potentially self-making.²⁸⁹ Pride in work among the working classes is strikingly illustrated when the source of employment is lost and unskilled work or state handouts must be relied upon to support the home and family. Bourke provides examples from the Great Depression in her study of British working class cultures, including the comment of an unemployed blast furnace worker that 'There is nothing quite like the dole. It is the final and irrevocable disaster to working-mankind'.²⁹⁰ Certainly some of these values can be detected in the culture of the Dockyard worker, who generally took pride in the skill he acquired to undertake his job, the hardships he endured and in the purpose of his work i.e. the defence of the nation. Dockyard workers also commonly made decisions relating to their work, career progression and safety with their position as family breadwinner firmly in mind, as will be seen in this chapter.

²⁸⁶ J. Tosh *Manliness and Masculinities in Nineteenth Century Britain: Essays on gender, family and empire* (Harlow: Pearson Education Limited, 2005) and J. Tosh 'Masculinities in an Industrializing Society: Britain, 1800-1914' *Journal of British Studies* 44 (April 2005).

²⁸⁷ Tosh 'Masculinities in an Industrializing Society', p331.

²⁸⁸ Tosh 'Masculinities in an Industrializing Society', pp331-2.

²⁸⁹ Tosh 'Masculinities in an Industrializing Society', p332.

²⁹⁰ J. Bourke *Working-Class Cultures in Britain 1890-1960: Gender, Class and Ethnicity* (London: Routledge, 1994), pp131.

Significant research has been undertaken into the experiences of men during the First World War and their impact on manliness and masculinities.²⁹¹ Some of these works have been consulted and found to have varying relevance. Michael Roper's article on the psychology of fear made some useful observations, but as it focussed on the experiences of middle class subaltern officers, few parallels could be drawn with the Dockyard worker. Where studies of trench experiences and shell shock have indicated a contribution to the widespread reassessment of the Edwardian concepts of manliness, such as repression of emotion, the evidence gathered during this study suggests that many of these tenets of manliness continued to exist in one form or another throughout the twentieth century. More relevantly, in placing the maimed servicemen returning from the First World War among a wider 'constituency of disabled people in Britain, Bourke links the rhetoric associated with men wounded in war to those injured at work: 'The language of warfare was applied to these men: they were 'Wounded While Working' or, as industrial efficiency experts were wont to remind people, 'Peace as well as War has its Toll of Life and Limb'.²⁹² Like, Johnston and McIvor's historical study of masculinity in Clydeside heavy industries, this study has also drawn on the research of other disciplines conversant in the study of gender.²⁹³ Hale provides a helpful definition of masculinity:

Masculinity can be defined as a vague concept but one that comprises values, experiences and meanings that are culturally interpreted as masculine ... Men do not follow a predetermined biological trajectory encoded in their physical organization; they do not inevitably grow from infants through boyhood to manhood. Rather, men are made.²⁹⁴

In contrast to the very early and simplified research into masculinity, it is now recognised that there are significant differences, between cultures, periods of history and individuals,

²⁹¹ For research on masculinities and manliness during and in the aftermath of the First World War see: J. Bourke *Dismembering the Male: Men's Bodies, Britain and the Great War* (London: Reaktion Books Ltd, 1999); J. Meyer *Men of War: Masculinity and the First World War in Britain* (Hampshire: Palgrave Macmillan, 2011); M. Roper 'Maternal relations: moral manliness and emotional survival in letters home during the First World War' in S. Dudink, K. Hagemann and J. Tosh (eds) *Masculinities in Politics and War: Gendering Modern History* (MUP, 2004); M. Roper 'Between Manliness and Masculinity: The "War Generation" and the Psychology of Fear in Britain, 1914-1950' *Journal of British Studies* 44 (April 2005).

²⁹² Bourke *Dismembering the Male*, p37.

²⁹³ R. Johnston and A. McIvor 'Dangerous Work, Hard Men and Broken Bodies: Masculinity in the Clydeside Heavy Industries' *Labour History Review* 69:2 (August 2004).

²⁹⁴ H. C. Hale 'The Role of Practice in the Development of Military Masculinities' *Gender, Work & Organisation* doi: 10.1111/j.1468-0432.2010.00542.x, p5.

in the way that masculinity is defined. Connell and Hale refer instead to multiple masculinities.²⁹⁵ Johnston and McIvor similarly state that masculinity is complex and varied.²⁹⁶ Connell first developed the concept of hegemonic masculinity that dominates any given male group in 1983 and observed that that some men ‘live in a state of some tension with, or distance from the hegemonic masculinity of their culture or community’.²⁹⁷ This is certainly apparent within the Dockyard community where, for some at least, the professionalism and progression associated with their level of education competed with the need to retain a hardened outlook toward the dangers that they faced in their everyday work. Other research looks at the organisational culture within different nations’ armed forces, suggesting that narrowly defined hegemonic masculinity is manufactured.²⁹⁸ Moreover, Hale claims that ‘Desired masculinities in military careers are associated with aggressiveness and endurance of hardships and physical toughness’.²⁹⁹ Meyer identifies that the ability to endure discomfort was viewed by soldiers in the First World War as ‘a positive aspect of their masculine identity ...’.³⁰⁰ Although work in shipyards cannot be directly compared with military service, to some extent the hard physical work, proximity to danger and potential for injury could be argued to be analogous with it. Johnston and McIvor argue that the ‘*machismo* attitudes forged in an almost exclusively male, tough and physically demanding work culture’ in Clydeside heavy industries were reproduced in a similar way to the masculine identities nurtured in military service.³⁰¹ The similarity is even more striking in the naval shipbuilding sector, where fierce patriotism commonly combined with a feeling that the work being undertaken was of importance to the security of the nation. It is tempting to consider whether the Admiralty constructed and/or actively encouraged masculine behaviours at any time, in order to make working conditions more attractive to men. The fact that masculine behaviours adapt with societal change could account for the efforts in later years to address certain behaviours, for example when trying

²⁹⁵ R. W. Connell *The Men And The Boys* (Cambridge: Polity Press, 2000), p10; Hale ‘The Role of Practice in the Development of Military Masculinities’, p5.

²⁹⁶ Johnston and McIvor ‘Dangerous Work’, p143.

²⁹⁷ Connell *The Men And The Boys* p11 and M. Cohen ‘“Manners” Make the Man: Politeness, Chivalry, and the Construction of Masculinity, 1750-1830’ *Journal of British Studies* 44 (April 2005), p312.

²⁹⁸ Connell on research conducted in Germany, the US and Australia in *The Men And The Boys* p215.

²⁹⁹ Hale ‘The Role of Practice in the Development of Military Masculinities’, p7.

³⁰⁰ Meyer *Men of War*, p25.

³⁰¹ Johnston and McIvor ‘Dangerous Work’ p147-8.

to encourage the use of personal protective equipment, in line with legislative obligations. The focus of this chapter is, however, on the impact of masculine culture within the Dockyard on workers' safety, rather than the origin of that culture.

Many workers entered the Dockyard as teenagers and expected to remain there until their retirement. The expectation of a 'job for life' was mentioned in many interviews and questionnaire responses. Indeed job security was almost guaranteed for workers who became 'established'. This term refers to the core of skilled workers that the Admiralty/MoD deemed it necessary to maintain in peacetime. Workers had to be recommended for establishment by their superiors and it was the intention that only the most skilled and best behaved workers should be entered on the establishment list. The Admiralty/MoD annually decreed the numbers of workers to be entered on the list. Establishment thus formed the basis of job security and Dockyard discipline. In return for the security and pension that establishment provided, the worker accepted lower wages than those paid to workers in equivalent employment in private industry. Thus 'job for life' and pension became overriding factors in maintaining not only a fund of skilled workers necessary for the smooth running of the Dockyard in peace time, but also a disciplined core workforce reluctant to strike for the fear of losing these benefits. The extended period of service undoubtedly resulted in a greater feeling of belonging and more opportunity to develop lasting friendships. Certainly when asked what single word they would use to describe the atmosphere and culture within Chatham Dockyard, the most common responses were 'family' or 'friends' (see table 4.1). This also reflects the fact that generations of families worked in the Dockyard and that workers often worked with friends and neighbours from outside of work. Paul Collins, motor vehicle mechanic from 1975 until 1978, commented on the friendships that he made in the Dockyard:

My time in the Yard was short but after a while I could see this is [where] I wanted to stay and progress. But this was not to be. I spent an enjoyable three years in the Yard and made many friends.³⁰²

The term *Matey*, defined in the *Oxford English Dictionary* as familiar; friendly; and a familiar form of address to a male, was used to refer to a Dockyard Worker. This is

³⁰² Questionnaire 51.

evidenced in the title of Christopher Andrews' memoirs: *The Life and Times of a Dockyard Matey*³⁰³ and in a humorous poem recalled by several of the men interviewed:

Can a dockyard matey run?
Yes indeed I've seen it done
At the tolling of the bell
See him run like flipping heck!³⁰⁴

Johnston and McIvor define workplace camaraderie as an 'important aspect of masculinity'.³⁰⁵ The work and conditions may have differed in some respects from those on the Clyde and the Dockyards were not concerned with profit as the private shipyards were. That the work was as 'dangerous, dirty, dusty and physically exhausting',³⁰⁶ cannot, however, be disputed. Just like Johnston and McIvor's subjects, workers in the Dockyards had to come to terms with the hazardous and demanding nature of their jobs. Lewing recalls a particularly dangerous task at the end of HMS *Oberon*'s construction (see image of HMS *Ocelot* at figure 4.1 for an idea of the drop from the side of the submarine to the bottom of the dock):

One of the last jobs left to do was for some young mug to be cajoled into scrambling over the side of the casing on top of the ballast tanks, a rope securely tied round the waist and grinding off the protruding studs of the manhole covers along the whole length of the boat. The minor job in itself but remember the submarine was in dry dock and it was a long drop if you slipped!³⁰⁷

Camaraderie among fellow workers was strong and a culture of competition between trades and gangs of workers thrived. Pride in trade and work, plus a sense of patriotic loyalty arising from employment by the Crown, were also evident from the questionnaires and interviews conducted for the study. There was also a strong sense of community and a perception of belonging to a kind of exclusive society, reinforced by the secrecy surrounding much of the Dockyard's work and the physical boundary provided by the Dockyard Wall. The subjects of this study expressed this as being 'inside the walls'. This

³⁰³ C. J. Andrews *The Life and Times of a Dockyard Matey* (privately published, 2006).

³⁰⁴ G2003/3.

³⁰⁵ Johnston and McIvor 'Dangerous Work', p141.

³⁰⁶ Johnston and McIvor 'Dangerous Work' p138.

³⁰⁷ Lewing *Recollections* p3.

was also evident in the other home Dockyards at Portsmouth and Devonport, though at the latter workers referred to a 'town within a town'.³⁰⁸

Like the Scottish shipyards, the Dockyards had their share of 'black humour, swearing and 'patter''. Ron Sullivan, a shipwright between 1962 to 1971, recalled that 'every second word was sort of prefixed by an expletive ...'.³⁰⁹ Humour bonded workers and, as a plumber, at John Brown & Co. Ltd., reflected 'I suppose [black humour] was a way of coping with what could be really tough conditions'.³¹⁰ It poked fun at the establishment, reinforced masculine behaviour traits and served as an initiation for new entrants. Indeed, when a new apprentice started work they were often sent to the Stores for a bucket of holes, sky hooks or tins of striped paint. Bob Blackman, former boilermaker, recalled being sent for a 'long wait':

I went in there once and he said "go and get the long wait boy, will you". I went in the Stores and said "my Skipper wants the long weight" he said [Storesman] "alright, just stand over there a minute while I serve these blokes" and I was standing there and he said "you waited long enough?", come to then and realised what was going on.³¹¹

Keith Yeats, joiner from 1946 to 1984, recollected the pranks that were played on apprentices in the Drawing Office:

... we had a windmill made of brass, I don't know where they got it from, probably made in the Yard, Coppersmiths [unclear] years ago. Anyway, they had this windmill and you filled it with black lead, you know, like you do stoves with and ... say "I'm trying to blow this mill" [makes blowing sound] "Oh you're useless aren't you, no let me do it", but you had your finger over a certain hole and he'd go [makes blowing sound], course it'd spin round blowing bits of black dust on his face. That was one, the other one was you get a bottle or tin and put it in the top of his trousers with a hole in it and you'd put a penny or better still a two-bob-piece on his head "if you can get that in that tin I'll give you the two-pence ... Course you'd try it and you'd drop it and you'd say "right we'll try it again". He'd go [acts

³⁰⁸ A. Day 'The forgotten 'mateys': women workers in Portsmouth Dockyard, England, 1939-45' *Women's History Review* 7:3 (1998), p363; R. Bartram and S. Shobrook 'You have to be twice as good to be equal', p60.

³⁰⁹ G2003/1

³¹⁰ Johnman, Johnston and Mackenzie *Down the River*, p23.

³¹¹ G2003/2.

out trying to drop the coin] and you'd pour water in the tin and of course he'd have wet trousers.³¹²

Cedric Salmon, shipwright then draughtsman from 1944 to 1982, remembered a story he had heard about a young worker in the Smithery:

I think there was one in the Smithery, they got a young lad there and he wanted to harden and temper something, "ah" they said "you've got to temper it in maid's water" they said "go up to the Sail Loft" he spoke to the ladies there, they said well we see what they can do and they did. Cor dear. The other blacksmith nearly went up the roof with the smell of it".³¹³

This seemingly harmless fun must surely have served to show the apprentice that he/she was on the outside of the group and to engender a desire to be a part of it. Those who had themselves once been victims relished their chance to inflict it on the next generation of entrants. This tradition would also seem to echo the ritualized humiliation and rites of powerlessness referred to by Bourke when describing the *esprit de corps* encouraged in the military.³¹⁴ The apprenticeship itself acted to further entrench the culture of the Dockyard. As well as learning their trade through the Dockyard school, each apprentice would spend time working with a skipper, who would teach them not only the technical aspects of the job, but also passed on the 'informal, unspoken workplace culture'.³¹⁵ A close bond often formed between skipper and apprentice.³¹⁶ Billy Childish' protagonist in *My Fault*, was taught to smoke by his skipper Bill Cubbitt, who had recently been told of the damage that smoking had done to his own health. Smoking was as popular among Dockyard workers as it was within the general population, but Cubbitt infers that the dangerous habit was as much a part of the masonry trade as the craftsmanship he had been teaching his protégé: 'That's it, that's it, take it all down! We'll make a mason of you yet!'³¹⁷ The connection between smoking and manliness is commonly reproduced in fictional works, such as McIlvanney's 1955 novel *The Kiln*: 'You really had to smoke at the dancing, he had

³¹² G2003/2.

³¹³ G2003/2.

³¹⁴ Bourke *Dismembering the Male*, p128.

³¹⁵ Johnston and McIvor 'Dangerous Work' p139.

³¹⁶ Lewing *Recollections* p3.

³¹⁷ B. Childish *My Fault* (London: Virgin Books Ltd, 2005), p187.

decided. It's hard enough trying to camouflage yourself as a tough guy as it is. Go in there without cigarettes and it would be like wearing a blouse.'³¹⁸

Practical jokes were also common among the working men. A smith who worked in the Dockyard between 1930 and 1980 commented that 'Every now and then you'd get a boy come in and we put a penny on the fire, drop it on the floor and say 'look.' They'd pick it up and of course it was very hot'.³¹⁹ The following example, also from the Smithery, was slightly more sinister:

In the Smithery if you said to a bloke 'got a piece of iron or something?' He'd say 'yes, there's a bit, there.' Now, you never took his word for it. The first thing you did was to spit on it. If it hissed you knew you didn't pick it up.³²⁰

In another example, a shipwright who caught a fitter singing during his work afloat remarked to the man that he had a good singing voice and suggested that he sing to the shipwright's mate:

"Don't stop working now," said the shipwright. "Just sing to him up the voice pipe as he is working just above on the upper bridge."

The fitter began singing the shipwright's suggestion: *April Showers* and was rewarded with a flood of water down the voice pipe.³²¹ Harfleet gave another example:

"... you know don't you that there weren't any doors on the toilets to stop you malingering behind them ... there was a brick wall between them so you couldn't look at each other there were no doors on the toilets at all. There was no individual flushing, it flushed automatically from one end to the other. So if you were sitting there, you couldn't sit there reading a paper, which was what the people used to do, because the chargeman could come down and catch you, but if you were just sitting there the apprentices could light paper at the other end so it flowed underneath you aight – well!"³²²

³¹⁸ Johnston and McIvor 'Dangerous Work' p141.

³¹⁹ J. Stanton *The Last Cast Off* (AIM Publications: Gillingham, Kent, 1990) p34

³²⁰ Stanton *The Last Cast Off*, p33.

³²¹ Stanton *The Last Cast Off*, p79.

³²² G2003/3.

Some gangs even used 'pea shooters' fabricated from a piece of foot long copper gauge pipe. The ammunition was a piece of Headly's compound, a yellow putty used by electricians to seal electrical fittings. A piece of compound would be pinched and rolled between forefinger and thumb and poked into the tube. The peashooter was normally carried in the rule pocket down the right leg of a worker's overalls:

The victim would be stalked and subjected to a vicious assault from all directions, from under the deck plates, from inside the air trunking if it was large enough, even inside the boiler, nowhere was safe. It never got out of hand, nobody got hurt just a little sting on the back of the neck, and it always stopped before discovery.³²³

Such horseplay and mischievous behaviour were identified by Iacuone as dimensions of masculinity.³²⁴ Some of this behaviour had the potential to cause serious injury or could even be life threatening. Its incidence can be compared with Beynon's findings that young men's machismo behaviour in a Ford car manufacturing plant created life-threatening situations.³²⁵ For example, if an apprentice came across a group of rivet boys and labourers in a tool box shed at break time he was likely to have hot rivets or other items thrown at him.³²⁶ The actions of the apprentice who caused the fire in No 2 Slip can be characterised in this way: the young man was intent on impressing his colleague with a dangerous act, which exemplifies the masculine trait of competitiveness too. Such pranks are an indication of the attitudes that men had to the conditions they worked in and the risks surrounding them every day. It may seem extreme for there to be such potential for injury and even death in a working day, but it can also be seen both as an aid to and the product of de-sensitising workers to the severe dangers that were present in their workplace. It should also be noted that the swearing, dark humour and horseplay were generally reserved for colleagues in the Dockyard and rarely followed the men home or even while socialising outside of the Dockyard. During my study it was rare for a man to swear in front of me and though they may have referred to swearing, they would frequently state that they did not swear in front of their wives or women. Bartram and Shobrook's study also found this to be common:

³²³ Lewing *Recollections*, p5-6.

³²⁴ Iacuone 'Real Men Are Tough Guys', p248.

³²⁵ Iacuone 'Real Men Are Tough Guys', p252.

³²⁶ Group Interview G2003/2, 1 December 2003.

[Nicky a female worker at Devonport Dockyard 1978-86] Don't you think that's what the men do when they go home ... live a normal life. The men don't have these pictures [pornographic photographs] on their walls at home, you hear them say well, we're not in the dockyard now, they don't swear outside the dockyard.³²⁷

Besides the competitiveness engendered by the Dockyard School/Technical College, many workers took part in sporting events, from the annual Dockyard Sports Day and annual Apprentices Raft Race to regular cricket, football, tennis, darts, billiards and even judo competitions. The Dockyard Sports Day in June 1980 attracted some 2,000 workers and their families. Besides the events one would expect, there was a tug-of-war contest.³²⁸ At the Navy Days event the same year, the primary purpose of which was to showcase the work of the Dockyard and the ships of the Fleet, six apprentices took part in a boxing demonstration.³²⁹ As well as illustrating the competitive aspect of masculinity in the Dockyard setting, sports such as boxing also demonstrated physical strength and prowess, which have also been identified as badges of masculinity, particularly in members of the manual working class.³³⁰

Attitudes towards women and beliefs about their 'role' are probably among the most common traits discussed when masculinity is scrutinized. In common with most areas of life in post-1945 Britain, the Dockyards contained examples of the polarity of emancipation and suppression of women, particularly from the late-1960s. For example, while women began to take on 'male' roles in work, they were still objectified in the work newspaper. The publicity in *Periscope*, which Lewing refers to, began with the announcement that 'girls' would be accepted as apprentices from 1969. The front page featured a cartoonist's impression of what a female apprentice would look like (see figure 4.2), while an article inside the newspaper stressed that female apprentices would be selected on the same criteria as their male counterparts and that they would not be treated any differently. It then goes on to describe, somewhat contradictorily, the types of work that female apprentices would go on to do:

³²⁷ Bartram and Shobrook 'You have to be twice as good to be equal', p63.

³²⁸ *Periscope* July 1980, pp6-7.

³²⁹ *Periscope* July 1980, p8.

³³⁰ Tosh *Manliness and Masculinities in Nineteenth Century Britain*, p37 and Paap *Working Construction*, pp109, 114 & 213..

Main opportunities for girl apprentices will be in electronics, radio and electrical work – many of the light and tricky jobs more easily handled by women.³³¹

Female workers appeared in *Periscope* as ‘Maid of the Month’ from 1974 until the newspaper’s last edition in June 1983. This tradition seems to have started with a lucky number competition and the selection of a young attractive girl to pick the winning number. Even when they began to take on traditional male roles in the 1970s, women were referred to in *Periscope* by their hair colour, appearance and with reference to their marital status. In July 1975, the Dockyard’s first female direct entry technician apprentice, Sukhdev Panesar, was featured as Maid of the Month and readers were reassured that ‘Despite smithery work, welding, and now woodworking, petite Sue – her name is Sukhdev – hasn’t developed any muscles’.³³² Jackie Brown, one of the Dockyard’s first female ships’ cleaners and 19 years old, was one of the few women to be photographed in her overalls (see figure 4.10). In the photograph Brown appears to be sweeping with a dustpan and brush, a task that fits with established gender roles. This is interesting given that her job was described by the foreman of the yard as predominantly a man’s job.³³³ The caption stated:

Our photographer caught Jackie in action – still managing to look attractive in overalls and safety helmet.³³⁴

When 18-year-old messenger Karen Mohan appeared as Maid of the Month in February 1981, the paper commented that she had become ‘used to the wolf whistles’ when out and about in the Dockyard on her bicycle.³³⁵ Susan Williamson, a machine operator from 1963 to 1972 also recalled being whistled and leered at when walking around the Dockyard.³³⁶ For just one issue, in March 1981, Maid of the Month was replaced by Beefcake of the Month. Though the editorial claimed that this was in response to demand from female workers, the man featured, slinger Alec Lowdell, epitomised masculinity. Lowdell not only appeared on the front page, but in an article on the back page with a crane driver and an

³³¹ *Periscope* 27 November 1968, p3

³³² *Periscope* July 1975, p1. NB. The direct entry technician apprenticeship was a new type of apprenticeship, which acted as a fast track to management roles; Zandra Bradley was the first female apprentice at Chatham Dockyard.

³³³ *Periscope* August 1977, p1.

³³⁴ *Periscope* August 1977, p1.

³³⁵ *Periscope* February 1981, p1.

³³⁶ Questionnaire 54.

electrician's mate who practised weight lifting with him in No 7 Slip at lunchtimes. The three had collected scrap from around the Dockyard to make their own weights.³³⁷

Some male workers appear to have been resentful of the publicity that female apprentices and workers received, despite the fact that much of it reinforced women's roles as wife/mother and sex object in society. For example, Richard Applegate, who had served an apprenticeship in the early 1970s (when the first females had also been undergoing theirs) recalled that 'female apprentice's [sic] were treated better than their male colleagues and given better opportunities to try to sale the role to other females by photo shoots etc'. He also felt that they were given more interesting projects.³³⁸ Lewing also commented on the amount of publicity that female apprentices received:

... they (women) got a disproportional amount of publicity, particularly in the *Periscope*. This [preferential] treatment did naturally cause resentment!³³⁹

Evans recalled Zandra Bradley, the first female apprentice at Chatham Dockyard, as a 'much photographed young lady – who posed with a 2lb hammer over her shoulder – about the last tool an electrical fitter would use!!'³⁴⁰ There is certainly plenty of publicity for Bradley and Panesar in *Periscope* and a number of photographs of them in the RDL, including two with Bradley wearing a pretty dress while resting a large monkey wrench over her shoulder (see figure 4.5), which, as Evans stated, was not a tool that she would ordinarily require for her work. While some of the shots of Bradley and Panesar are individual shots, some are for winning awards (figure 4.3) and others are group photographs where Bradley is the sole female among eight or ten apprentices (figure 4.4). Shots of female apprentices in dirty overalls doing their jobs were fewer. One example is of apprentice plumber Marion Rodgers, although even this photograph appears staged, with Rodgers wielding a lit torch, but not actually working with it (see figure 4.6). The article that accompanied the photo opened with:

³³⁷ *Periscope* March 1981, pp1&12.

³³⁸ Questionnaire 25.

³³⁹ Email correspondence with Phillip Lewin, 8 February 2012.

³⁴⁰ Questionnaire 33.

Pretty Marion Rodgers manages to look feminine even though she's doing what was exclusively a man's job.³⁴¹

It went on to quote Rodgers' comment that the boys on the course 'treat me as just another boy' and mentioned that she played football with them in her lunch break.³⁴² Linda Read, electrical fitter apprentice and Bradley were taken away from their benches in 1973 to represent the Dockyard at the Kent County Show. They were told that they had been chosen in an effort to encourage more girls to apply for apprenticeships. Read did not welcome this diversion from her learning or the consequent attention that she received back at the Training Centre:

I had to spend two or three days ... cutting photographs up, they'd got photographs of other apprentices and I'd got to stick them on cardboard to make the display, you know. All the lads were there filing and making their tools and keeping up very well, but of course this set me back several days and I was behind when I came back and of course as far as they were concerned I was behind because a woman shouldn't be doing the work. They [management] didn't help by doing that to me, keep drawing attention to me, preventing me from just getting on with it really, which is all I ever wanted.³⁴³

Read's experience, as one of just three female apprentices indentured in 1973, shows that the number of trades that a girl could learn were limited. After attending a parents evening where the available trades were listed as: shipwrights, joiners, plumbers, coppersmiths, smiths, iron caulkers and riveters, sailmakers, welders, fitter and turners, boilermakers, hose makers and electrical fitters, she received a letter telling her which of those trades were open to female candidates:

Dear Miss Read, further to the parents' evening held for apprentice trade selection held on the 26th April 1973, you are advised that the following trades are available to potential girl entrants: shipwright, joiner, sailmaker, fitter & turner, hose maker and electrical fitter ... They told me, the management people that talked to me, told me it was the unions. They told me they were having a great deal of difficulty getting the unions to accept women because they felt that it would lower, you know, would cause problems because women worked for lower rates than men.³⁴⁴

³⁴¹ *Periscope* February 1978, p2.

³⁴² *Periscope* February 1978, p2.

³⁴³ Interview with Linda Read, Chatham Dockyard, 19 June 2004.

³⁴⁴ Interview with Linda Read.

News that she was successful in passing the Dockyard exam was sent to Read's father, as was the majority of correspondence concerning her apprenticeship. The initial correspondence appears to have been in the form of standard letters and no effort was made to amend them to reflect the fact that she was female. She brought the first letter with her along to the interview, from which the following excerpt was taken:

We are very pleased that your son has passed the entrance exam for a Chatham Dockyard apprenticeship. The Royal Dockyard can be a very worthwhile and interesting career for any boy who is prepared to learn.³⁴⁵

The attitudes of male questionnaire respondents towards female workers taking on industrial roles can be hard to gauge, particularly as the majority were aware that the study was being conducted by a woman. Also the acceptability of certain behaviours and opinions has changed in the recent past. Some respondents acknowledge this by saying that things that occurred during their period of working would not be appropriate now. It is possible that others modified their responses to appear more in line with current norms and values. One of the overwhelming responses to the question 'how were women treated in the Yard?' was 'with respect'. This rather vague statement could refer to a respect for women's equality, but in most cases probably meant that they were treated with politeness, doors were opened for them and that men did not swear or tell crude jokes in front of them. It seems that this 'respect' was withdrawn if women showed masculine behaviour traits themselves:

In offices, they were well respected and good manners shown towards them. But if they showed any of the yard man's traits – swearing, or being crude – then all women (office or industrial) were seen as fair game for a laugh.³⁴⁶

Only three respondents openly disagreed with women taking on apprenticeships in traditionally male roles and their comments are included below. All of these men joined the Dockyard in the 1950s and had not worked with women during the Second World War. Only one actually worked in the Dockyard after the first female apprentice was indentured

³⁴⁵ Interview with Linda Read.

³⁴⁶ Questionnaire 31.

in 1971. Robin Downs, a painter from 1958 to 1964, stated that, although he did not work in the Dockyard when women took on apprenticeships 'If I had thought about at all, at the time probably disapproving' and Derek Hargrave, shipwright then analytical estimator from 1952 to 1966, commented 'I did not agree with it. They were not physically built to work on ships'.³⁴⁷ Brian Jenkins, engine fitter then recorder from 1953 to 1984, felt that women were not suitable for all jobs.³⁴⁸ It was common for men to think that some tasks were beyond the physical capabilities of women. The sceptics thought the work would be too hard on the female physique and the language too blue for women's sensitive natures. Lewing stated:

... there was no objections to the introduction of women apprentices in particular, that came later when it became obvious that women did not have the physical strength and stamina to do certain jobs, particularly afloat when working on ships, they were seen as a liability to a gang of men.³⁴⁹

Harfleet was not outwardly negative about women apprentices but 'wondered how they would cope once qualified'.³⁵⁰ There was a perception that, once qualified, women would end up on lighter work and office work in the drawing office, as technicians and in management roles. David H. Evans, electrical fitter then acting electrical engineer 1941 to 1984, recalled:

I didn't think it would happen. As with normal entries, some females were quite good. I did not hear of any females working as electrical fitters. They did obtain academic qualifications & become draughtspeople, technicians, PT04 & were employed on light current systems ... Females never undertook all male tasks or the full range of craftsmens duties. They could undertake tasks within their physical & technical capabilities (when I left in 1984 female electrical fitters were not employed in the afloat (ships) installations or Yard Services, sections (i.e. the heavy engineering sections).³⁵¹

The paucity of personnel records make it difficult to ascertain whether Evan's comments reflect the common experience of female workers; it is certainly true that Bradley and

³⁴⁷ Questionnaires 60 and 132.

³⁴⁸ Questionnaire 150.

³⁴⁹ Email correspondence with Philip Lewing 8 February 2012.

³⁵⁰ Questionnaire 24.

³⁵¹ Questionnaire 33.

Panesar qualified as technicians and while Read did qualify as an electrical fitter and was, therefore, considered a 'craftsman', she opted to work in the Radio Centre on relatively light work, though this was through an interest in the type of work rather than a desire to avoid harsh conditions afloat.³⁵² During her apprenticeship she did, briefly, work afloat on the refit of the Leander Class Frigate HMS *Aurora* and in the Yard Services Management (YSM) Department. She recounted one situation where her physical capability was tested by her skipper and colleagues on board *Aurora*:

I remember one particular incident when ... my skipper ... had given me a job to tighten up some bolts with this whopping great big spanner, I think it was done as a bit of a joke really, you know, I collected an audience and they were all saying, you know, "put your back into it" and all this ... and that was the kind of thing you got every day ... [they] would poke fun at the fact that a woman was doing the job ... I looked at it, sort of, here's a job, here's a large spanner and I couldn't sort of physically pull it down with my arms and shoulders because I'm not built that way, so I put my body into it and was pushing, you know, because obviously the stronger muscles in a woman are in the body and the legs, you know, so I coped with the job.³⁵³

Read also recalled that she was made to wear white overalls, rather than the green overalls that craftsmen and craft apprentices wore while afloat, in order that her colleagues would know that she was a woman.

I was always made to feel different. I mean, you'd have somebody walk up on the ship and say (excuse me) something like "where's the fucking bridge mate" you know and of course I'd answer in my lighter voice and [they would say] "oh I'm dreadfully sorry my dear". Other people would walk up and they would just simply say "where's the starboard head?" [toilets were referred to as heads as they were aboard naval ships] and I'd just answer and they'd still apologise even though they hadn't sworn or anything. They were just so shocked at finding a woman there where they didn't expect to see one you see. And so they put me in white overalls so I would stand out. I must say it didn't work, so after three weeks I insisted on going back to wearing the standard overalls again because I'd have people come up and ask me technical questions instead, you know, thinking I was some supervisor and then they'd still be surprised ...³⁵⁴

³⁵² Interview with Linda Read.

³⁵³ Interview with Linda Read.

³⁵⁴ Interview with Linda Read.

At least two women did take on very heavy and physically demanding work. Rita Spinks and Valerie Rydale completed a nine-week slinging course and qualified in 1977. An article about them in *Periscope* states that the tasks they undertook included lifting the six-ton rudder from HMS *Eskimo*, dismantling an overhead crane and helping to remove the main engines from HMS *Leopard*. It also commented:

Mr. Ted Weekes, T/S in charge of the course, which also included five men, said: “We treated them as equals and didn’t show them any favouritism. The men were convinced they wouldn’t be able to cope with the work, but they’ve certainly had their eyes opened.”³⁵⁵

The overwhelming response from the questionnaires was either positive or ambivalent. Clive Stanley, engine fitter and turner then draughtsman from 1967 to 1978, remembered ‘At the time, we apprentices thought “Good-o!” more chances to see girls!!’ but also that, for him at least, the appointment of female apprentices resulted in ‘more respect and appreciation that woman can equal or better men in traditional male jobs’.³⁵⁶

Unlike attitudes towards women, poetry is not, perhaps, a characteristic that one readily associates with masculinity, yet *Periscope* frequently published poems written by workers, including the following examples. The first was written by C. Gilbert, technical supervisor of welders and published in 1976, presumably in an attempt to encourage safe working:

Health and Safety
Let health and safety be your guide
Be ever alert with eyes open wide
Your health and safety concern everyone
Take care of yourself and get the job done³⁵⁷

The following poem, titled *Driver’s Lament*, was published anonymously and is a satirical comment on the conditions in the Dockyard:

A LORRY driver stood at the Pearly Gates
His head was bent real low,

³⁵⁵ *Periscope* January 1977, p1.

³⁵⁶ Questionnaire 181.

³⁵⁷ *Periscope* March 1976, p2.

He meekly asked The Man of God
Which way he had to go.
“What have you done?” St. Peter asked,
“To seek admission here?”
“I worked in Chatham Dockyard, Sir.
“For many and many a year.”
St. Peter opened wide the Pearly Gates
And gently pressed the bell;
“Come in” he said, “You’re welcome here,
“You’ve had your share of Hell.”³⁵⁸

A more serious work, this time published under the worker’s nickname: Nobby the Mobile, gives detailed insight into the conditions that befell the worker aboard a submarine and was probably true for much work afloat on ships too:

I loathe refitting submarines, they’re so confined and cramped –
Enthusiasm for that job has long ago been damped.
Their claustrophobic atmosphere, so depressing to the brain;
Complexity of gear installed requiring mental strain.
That ever present risk of fire, with minimal escape;
Those injuries that we sustain – the bruise, the cut, the scrape
No room to move, no room to work, that jungled maze of pipes,
Those boxes all electrical, so many size and types.
As if those weren’t enough, those endless miles of wires;
The air so drained of oxygen that every moment tires.
The great lamps and the welder’s arc fight with us for life’s fuel,
Our nostrils blackened with their soots as we end each day’s duel.
Those tradesmen crowded working there, each following his craft;
Those three small hatches often closed restricting thermal draught.
No ventilation’s fresh supply to clear the brain for thought,
Bufuddling basic principles on which your trade is taught.
You put things up, you take things down – they’re in somebody’s way;
Not once or twice, but three times moved, before they’re up to stay.
Each time a different problem faced of how to do the job –
No wonder tempers start to fray as headaches start to throb.
You can’t weld here, you can’t drill there, contesting every inch –
The jobs required on submarines would make a stalwart flinch.
No trade liaison intertrade, no drawing, sketch or plan;
Just photographs of other subs and “Match that if you can!”
Then, when you’ve done, the critics come, those superbrains in white
To tear apart your hard-done work appears their main delight.
They make “as fitted” drawings then, or photograph your work
To use upon some other sub and drive those men beserk.
I’d like to take all submarines and sink them somewhere deep,

³⁵⁸ *Periscope* January 1970, p3.

Then get myself a masthead job where through your hair winds sweep,
Where one can see ten miles or more, and sense of freedom reigns,
Not cooped up in some submarine like some blind mole in chains.³⁵⁹

The latter two poems reflect the heroic discourse apparent in the testimonies of Johnston and McIvor's subjects.³⁶⁰ Rather than pride in craft or physical endurance they advertise the hardships that men faced, using hell as a metaphor. Lewing's *Recollections* also include a description of conditions aboard submarines in the 1960s:

Safety equipment, earplugs, masks and goggles were non-existent, so were washing and welfare facilities. The Health & Safety at Work Act was another ten years away. Working afloat, particularly on submarines was hard, strenuous and sometimes very dirty. It required crawling and squeezing into some very tight corners and naturally there was no sunshine inside the submarine. It was definitely a young man's [sic] job.³⁶¹

Workers were often known by nicknames. 'Half-a-Day Jack' gave the practical rationale for this, i.e. 'if someone wanted something and shouted 'Jack', half a dozen blokes would answer'.³⁶² Johnston and McIvor draw attention to the less positive side of the practice, such as the identification of weakness or injuries suffered during the course of work.³⁶³ Other nicknames, even if they acted as a kind of caricature, were often regarded with fondness by their owners, as Lewing's testimony suggests:

It was during this first year that I acquired the nickname Noddy. I don't recall who gave it to me but everybody had a nickname so it didn't matter. I was only 4ft 9 inches tall with a mop of red hair; this may have been a clue. The name stuck throughout my working life and at home, even now 50 years later, if the wife calls me Philip I know I'm in the doghouse!³⁶⁴

One fitter earned the nickname 'Gunner' after an incident that involved him during the Second World War:

³⁵⁹ RDL, not catalogued.

³⁶⁰ Johnston and McIvor 'Dangerous Work', p141/6.

³⁶¹ Lewing *Recollections*, p4.

³⁶² Stanton *The Last Cast Off*, p5.

³⁶³ Johnston and McIvor 'Dangerous Work', p138-9.

³⁶⁴ Lewing *Recollections*, p2.

When ships were despatched back to the Dockyard, having been damaged in action, it was normal practice to leave the anti-aircraft guns loaded and ready for action. This was in case of an enemy aircraft attack, as the ‘yards were a prime target. On this particular occasion, [the fitter] was working on a ship in No. 9 Dock and wanted to “train” a gun mounting to a different position. These guns were “trained” or moved to the left or right by rotating a handle, similarly, the gun barrels were raised or lowered by operating the “elevation” handle, which when rotated, operated the firing mechanism. So, no prizes for guessing what happened, but yes, [the fitter] tried to train the mounting by operating the firing handle. Fortunately nobody was killed, but several holes were put through a nearby storehouse roof and quite a few including [the fitter] had to change their underpants.³⁶⁵

Lewing also recalled the nicknames of some of the teaching staff in the Technical College:

There were 4 Instructors, Mr “Charlie” Brown, Mr “Sammy” Seal, Mr “Winkle” Perry and Mr (?) Turnbull (I’ve forgotten his nickname, but I do remember that he used to tell exaggerated stories of his war exploits which kept us boys amused for hours).³⁶⁶

Although rivalry between trades was common, workers could be fiercely protective of their colleagues if an outsider deigned to criticise them. In the first group interview I conducted, the visit of MP Anne Kerr to the Dockyard in 1970 was mentioned. She claimed publicly that she had seen workers hanging around idle, when they were waiting for the ship they were due to work on to enter the dock. Yeates took matters into his own hands when his colleagues were accused of slacking by an outsider:

Going back to the nuclears, I always remember about what people say about dockyard people. I took a chap down there from one of the firms, I forget which one it was now and I got permission to take him on and anyway, while we was walking down there he said “there’s always people hanging around outside” you know, and he said “what are they doing ... I’d have them working on this boat” so I said “OK I’ll show you where they were working”. So I took him on board and they were welding in the snort mast and there’s this massive great plate, preheat iron of course, everything going and it was as hot as hell and I started talking to him, knowing that he was getting hotter and hotter, and I can carry on a bit can’t I? As I have proved. Anyway, so he saying “it’s fairly hot in here” I said “yeah, but I wanna show you this ‘cause this is part of your equipment” and in the end he said “I must go up for some air”.³⁶⁷

³⁶⁵ Andrews *The Life and Times of a Dockyard Matey*, p58.

³⁶⁶ Lewing *Recollections*, p2.

³⁶⁷ G2003/2.

The outside view that Dockyard workers were lazy caused a great deal of resentment, despite the fact that there is plenty of evidence to suggest that some workers were quite inventive in their efforts to work as little as possible. For example, when he joined the Dockyard, Eddie Pynn, progressman technical planner from 1973 to 1984, was taught the 'Dockyard saunter', to be used when he was a distance away from, but in view of his chargeman. He was told that if he moved his arms very quickly, while walking slowly, it would look as though he was rushing.³⁶⁸

It is clear from the foregoing that a culture of masculinity existed in the Dockyard and 75% of respondents to the main questionnaire agreed with this. But what did this mean in terms of workers' health and safety? If we consider that the following attributes are among those that contribute to masculine culture, we can start to understand how its preservation could be to the detriment of men's health and safety:

1. the view of the self as provider, especially when married with children;
2. the view that hard physical work was befitting for a 'real man';
3. the belief that women and children should be protected and provided for; and
4. the belief that risk-taking, competitiveness and toughness constituted manliness.

The following chapters contain examples of men putting their long term health second to their earning ability and/or to getting the job done. Pynn commented that 'you get some people that if the money's right they'll do the job'. In the same group interview, mention was made of the obnoxious conditions and dangerous working allowances that provided financial reward for workers willing to take on such work. Obnoxious conditions allowances are discussed in the Whitley Committee meetings as early as 1945, when a complaint was raised by the Staff Side that inconsistent payments were being made to men, which in itself suggests that the allowances had been in place for some time.³⁶⁹ They were certainly in place by the late 1950s and former fitter Robert Smith refers to them in his memoirs:

³⁶⁸ G2003/1

³⁶⁹ RDL, Minutes of the 126th Meeting of the Chatham Yard Industrial Whitley Committee Held on Tuesday, 25th September, 1945, p3.

The amount [of obnoxious conditions money] would vary depending on how many hours you worked in those conditions but would usually be about £1.³⁷⁰

Environmental Allowances in place by 1977 are listed in table 4.2.³⁷¹ An allowance was payable where full protective clothing and equipment caused serious discomfort. This included protection against asbestos and nuclear contamination. Presumably this incentive was to encourage workers to use protective equipment that was uncomfortable, hot and made it difficult for them to work. Although almost certainly obtained by the trade unions, its existence is further proof that by 1977 protective wear was available and suggests that workers' resistance to its use persisted. It also gives credence to the argument that physical discomfort and a reduction in work output influenced some workers to decide not to use protective equipment. The questionnaire responses contain testimony to the fact that health and safety measures increased the time it took to complete work and with performance based incentives, such as piecework and payment by results³⁷², the temptation to avoid obstructions in order to earn more money was always present. This was not a new phenomenon and certainly not confined to dockyard workers, as Weindling demonstrates with a song sung by Sheffield grinders in the 1860s:

He shortens his life, and he hastens his death
Tally hi-o, the grinder!
Will drink stell dust in every breath...
Won't use a fan as he turns his wheel
Won't wash his hands ere he eats his meal
But dies as he lives as hard as steel...
Where rests the heavier weight of shame?
On the famine-price contractor's head

³⁷⁰ R. Smith *A Dockyard Apprentice's Story: Hard graft, scrapes and japes on the long road to becoming a trained engineer* (Gloucestershire: Memoirs Publishing, 2012), p62.

³⁷¹ G2003/1

³⁷² The piecework scheme was a method of measuring the amount of work undertaken by tradesmen and working out their pay. It had long been employed in the Dockyard especially in trades such as bricklaying, ropemaking, sailmaking, sawing and caulking. Crawshaw records that in the mid-1700s the Admiralty Board dictated that piecework be used in all trades in the Dockyard. Workers would be paid according to how many units they had completed, for instance how many feet of steel plate they had fixed. The units themselves would be 'priced', i.e. a figure was established that could be earned for each one according to how long it was estimated that the job would take. The pricing was established by the Admiralty. In 1966 the Dockyard Incentive Bonus Scheme (DIBS) was introduced, which was based on the length of time it took to complete a job. Both the Piecework Scheme and DIBS influenced how safely some workers carried out their tasks.

Or the workman's under-taught and fed
Who grinds his own bones and his child's for bread?³⁷³

Workers were also able to work 'time in lieu', which meant if they took a shorter lunch break, they could leave work earlier in the evening. This often meant that workers ate their lunch aboard the ships, among the dust and fumes, etc., to reduce stoppage time.³⁷⁴ A more pertinent example of men putting their health second to their earning capacity was discovered in the Industrial Whitley Committee minutes. In 1948, the annual mass radiography examinations, held within the Dockyard by the Ministry of Health primarily to detect cases of tuberculosis, were poorly attended. The Staff Side was asked for its thoughts on why so few men had volunteered to be examined and the response was that 'the main causes were laziness and a fear of extensive sick leave or even of invaliding'.³⁷⁵

The possibility that competing official safe procedures and unwritten 'actual operating procedures' (AOPs) existed should not be discounted. Paap found that, in the US construction industry, these two sets of rules – one for external audiences, such as the US Occupational Safety and Health Administration, and the other informally communicated between supervisors and workers. She draws attention to the complex interrelation between the unofficial industry rules, which often required violations of safety rules, and the values and practices of working class masculinity. In particular, loyalty to fellow workers and to management encouraged taking short cuts that endangered the self in order to meet the economic needs of management or to avoid slowing down colleagues' progress.³⁷⁶ Paap identifies unwritten 'Cultural Rules' that are helpful in determining how masculinity, working-class culture and work interplay. For instance, in 'Cultural Rule # 1: Expect Pain and Take It Like a Man', Paap describes construction as 'a largely physical occupation ... [that] tends to be rife with discussions of injuries, risk, and great mistakes'. She uses a third-year apprentice's view that injury was inevitable, but who lamented the worker who complained about the fact rather than the potential for harm. Those who did not anticipate the risk of injury as part of their day-to-day job and 'take it like a man' were

³⁷³ P. Weindling 'Linking Self Help and Medical Science: the Social History of Occupational Health' in P. Weindling (ed) *The Social History of Occupational Health* (London: Croom Helm, 1985), p9.

³⁷⁴ Smith *A Dockyard Apprentice's Story*, p81.

³⁷⁵ RDL, Minutes of the 140th Meeting of the Chatham Yard Industrial Whitley Committee Held on Monday, 7th March, 1949, p71.

³⁷⁶ Paap *Working Construction*, pp162-8.

deemed not to be men. ‘Cultural Rule #2: Protect others over Yourself’, i.e. workers should be willing to put their own safety in jeopardy in order to protect others. Chapter 3 of this this contains an example of a crane driver rushing to the aid of his colleagues trapped inside a burning submarine fin, which may suggest that this trait was exhibited in some Dockyard workers. Given that the majority of workers stood and watched on this occasion, this rule may be more successfully extrapolated to the protection of the welfare of one’s family by putting oneself at risk at work. ‘Cultural Rule #3: Doing “What the Job Requires” and “Getting the Job Done”’ can explain some of the risks and short cuts, especially with regard to safety, that were taken in the Dockyard, especially when deadlines were tight. Finally, ‘Cultural Rule 4: Carrying the Boss’s Burden and Shouldering the Costs of Safety’. Paap explains that:

The economic interests of the employer are taken as the primary interests on the [construction] site. “Getting the Job Done” becomes everyone’s top priority, and concerns for safety are left to those who aren’t team players or who are insufficiently masculine.³⁷⁷

In the Dockyard, where the profits of proprietors or shareholders are irrelevant, this rule appears to be echoed in the loyalty of workers to crown and country, with concerns for safety being left to the unpatriotic, particularly in a state of national emergency. It would certainly help to explain some of the actions taken in the Nuclear Complex as the demands of the work began to outgrow the available skilled workforce (see chapter 6).

Some recognised the benefit of safeguards, even when they did increase job time. Shipwright Donald Bradley, who worked in the Dockyard from 1948 to 1982, recognised that health and safety precautions made his job safer, but also noted that jobs took longer and involved more people as a result of health and safety inspections.³⁷⁸ Richard Eddowes, shipwright then foreman of the yard from 1973 to 1982, commented that he ‘had to plan timescales [and] staff nos to ensure H&S was fully considered for all projects’.³⁷⁹ Others fashioned their own rudimentary protection where they perceived it was needed, but not provided. Joe Dawson, who entered the Dockyard as a labourer/rivet boy in 1937, had

³⁷⁷ Paap *Working Construction*, pp162-8.

³⁷⁸ Questionnaire 32

³⁷⁹ Questionnaire 12

attempted to protect his hearing throughout his career and eventually put his health first when advised by his doctor that his hearing was at risk:

... I was a person that was conscious of this thing and I was always bunging my ears up with cotton wool right from the very beginning so I didn't become stone deaf, but I left the Dockyard at the age of 60 and I was told that if I carried on for another five years I'd be stone deaf. I was told that by a specialist and when he told me that he said this is just between me and you as my patient, he said, you'd be stone deaf if you carry on with this for another five years. So I retired a week after 60 years of age.³⁸⁰

Lewing's comments indicate that there was a tendency to accept protective measures where the risk was most tangible but not where the risk was long term or less obvious. Smith's recollections support this and also draw attention to the fact that self-image precluded some men from requesting safety equipment:

In fact there was a culture that it was unmanly to request any safety equipment, probably the only exception being the wearing of safety goggles, as so many workmen had lost eyes.³⁸¹

The fact that protective equipment, especially when it was first introduced, was uncomfortable and restrictive did not help. Furthermore, in most cases although protection was provided, its use was not mandatory and unlike today workers often had to pay for it, as the safety footwear scheme demonstrates.

There are some circumstances in which workers perceived, rightly or wrongly, that protective equipment was not only obstructive, but posed a greater immediate danger than the one it sought to avert. A former smith alluded to dangers arising from not being able to communicate with the driver of the steam hammer when wearing ear protection:

The conditions under which we worked then wouldn't be allowed today, not with the health and safety regulations. When you're working under a steam hammer the driver has got to be able to hear you. You're working the metal through to shape it out. He's coming down bang, bang, bang. If you've got ear muffs on and he's got ear muffs on ... I don't know...! We suffered in silence.³⁸²

³⁸⁰ Interview with Joe Dawson, Chatham Dockyard, 19 June 2004.

³⁸¹ Smith *A Dockyard Apprentice's Story*, p75.

³⁸² Stanton *The Last Cast Off*, p33.

Sometimes a worker's welfare could not practically be put before the job without resigning. Childish writes about his aged and ailing skipper Bill Cubitt, who spends much time absent due to high blood pressure and heart problems. Returning from one such absence Cubitt recounts the advice of his doctor: 'It's the damp, that's what does it ... Steer clear of the damp he says, and what hope is there of that, we're virtually in the bloody river!'³⁸³

The Dockyard's newspaper played a significant role in disseminating management messages. Today it provides examples of the culture that was pervasive within the Dockyard and many of the examples used in this chapter have come from the newspaper. Some of the most perceptive contemporary commentators were the cartoonists and examples of their work are included at the end of this chapter.

There is undoubtedly evidence to support the theory that the Dockyard had strong masculine culture; this was in common with the majority of industrial workplaces in the UK and overseas. It could be argued that the dangerous and physical nature of Dockyard work attracted a particular type of worker. Unlike many private industrial workplaces, however, the Dockyard, through its school and its connections with the Admiralty at Bath, provided opportunities for career progression and social mobility that also attracted the sort of man who would be categorised by Lynch as a Complicit man or one who would not be expected to exhibit the kinds of behaviour described in this chapter.³⁸⁴ There were areas within the Dockyard where the risks would appear to be less great, such as the Drawing Office. But work afloat and in the workshops presented serious risks every day, risks that were oblivious to hierarchy or trade. This is demonstrated by the examples mentioned in this thesis and within the Dockyard's accidents records.

There was a perception that weaker people could not endure the severe conditions and this was particularly evident when women (or the 'weaker sex') began to be appointed in traditionally male roles. Adopting a 'macho' persona (for both men and women) may have been a means to gain acceptance into the group and within that group to find solace among colleagues who understood the dangers that faced all. Workers would need to dissociate themselves from the death of a colleague. The group also offered its own form of protection. In some cases the observation and quick thinking of colleagues help saved

³⁸³ Childish *My Fault*, p186.

³⁸⁴ Iacuone 'Real Men Are Tough Guys', p252.

men's lives. Tranah's quick actions during the HMS *Toneleiro* fire is one example, although this must be tempered by Ledger's statement that about 400 people stopped work to watch the event, none of whom attempted to help the men.³⁸⁵ Pynn explained how the elitism that was so prevalent in the Dockyard School and other situations within the Dockyard, became somewhat redundant when working afloat and in close proximity. He spoke of the tolerance that was needed when they were 'all working in each other's pockets'. Sullivan agreed with him and pointed out the danger of arguing with a colleague when the conditions could be so dangerous.³⁸⁶ The evidence herein shows that groups would berate what was seen as weak behaviour; behaviour that could in its extreme threaten the safety of the individual and the group.

Masculinity has both positive and negative connotations. It is often disparaged for encouraging reckless behaviour, violence, homophobia and sexism.³⁸⁷ While examples within this chapter provide some support for this, it is also apparent that masculine behaviour and male group cohesion played an important role in helping workers to cope with the conditions that they worked in and had little control over. As in the military, masculinity is manufactured in such conditions. Paradoxically, masculinity has also been shown to be a contributor to the hazardous environment of the Dockyard through behaviours such as risk-taking, provider mentality and horseplay.

While it is clear that a masculine culture enhanced the dangerous conditions, it has also been shown that the masculine behaviours varied greatly and were not exhibited uniformly by all male workers. Furthermore, masculinity was not the only contributor to the hazards that faced workers; management/supervisory failure, complacency, ignorance of the extent of risks and practical choices (i.e. between a lesser and a greater danger) also impacted on workers' health and safety.

The following two chapters consider two of the major health risks that faced workers: asbestos and nuclear radiation. They provide further evidence of the hazardous nature of the work and give further thought to the impact of the causal factors of injury and disease.

³⁸⁵ *Periscope* December 1975, pp1&7.

³⁸⁶ G2003/1.

³⁸⁷ See Johnston and McIvor 'Dangerous Work', p136.



Figure 4.1 HMS *Ocelot* in Dock No 3 in the Chatham Historic Dockyard Museum.
Source: Author's own photograph (colour formatted to greyscale).



Figure 4.2: Cartoonist's impression of what a female apprentice would look like. The unrealistically tight overalls reveal a voluptuous body, but the make-up free face, scraped back hair and expression make the woman look austere. She also has disproportionately large hands and wide shoulders, suggesting perhaps some masculine features.
Source: RDL, *Periscope* 27 November 1968 (black and white).



Figure 4.3: Sukhdev Panesar being presented with Apprentice of the Year Award in 1978. The award was made to the apprentice judged best across all four home dockyards and in 1978 was presented by Mr F J Chapple. The competition was introduced in 1949 in memoriam for Tom Nevard, Assistant Secretary, Labour Branch of the Ministry of Supply, who had been a member of a Departmental Committee that had made recommendations on apprenticeship schemes.

Source: RDL 2007.0017.96 PHA 12352 (black and white).



Figure 4.4: 1971 entry technician apprentices receiving their deeds in 1975. They were the first technician apprentices to receive deeds. All had transferred from other apprenticeships. The one female apprentice is Zandra Bradley. Source: RDL 2007.0118.84 PHA 18240 (black and white).



Figure 4.5: Zandra Bradley, first female apprentice. Bradley joined as an electrical apprentice and later transferred to a technician apprenticeship. She is photographed in inappropriate dress for her job and the wrench over her shoulder would rarely have been required in her daily tasks. A version of the photograph was published on the cover of *Periscope*, October 1973.

Source: RDL Ref. 2007.0128.54 PHA 19210 (black and white).



Figure 4.6: Marion Rodgers, first female apprentice plumber. Despite appearing in her overalls, this photograph of Rodgers is clearly staged, with her wielding a lit torch for effect. The photograph was published on page 2 of *Periscope*, February 1978, along with an article titled 'Marion's 'one of the boys''. Source: RDL Ref. 2007.0058.13 PHA 13869 (black and white).



Figure 4.7 "Noise Control". Here Cartoonist Wilding plays on Dockyard workers' humour to illustrate the benefits of ear defenders. Blissful expression on man's face suggests that the defenders were comfortable to wear and preferable to loud noises. This reinforces gender roles, i.e. suggesting a working man returning home to his wife who has cooked him a meal and who is also 'nagging' him. Source: *Periscope* April 1972, p9 (black and white).

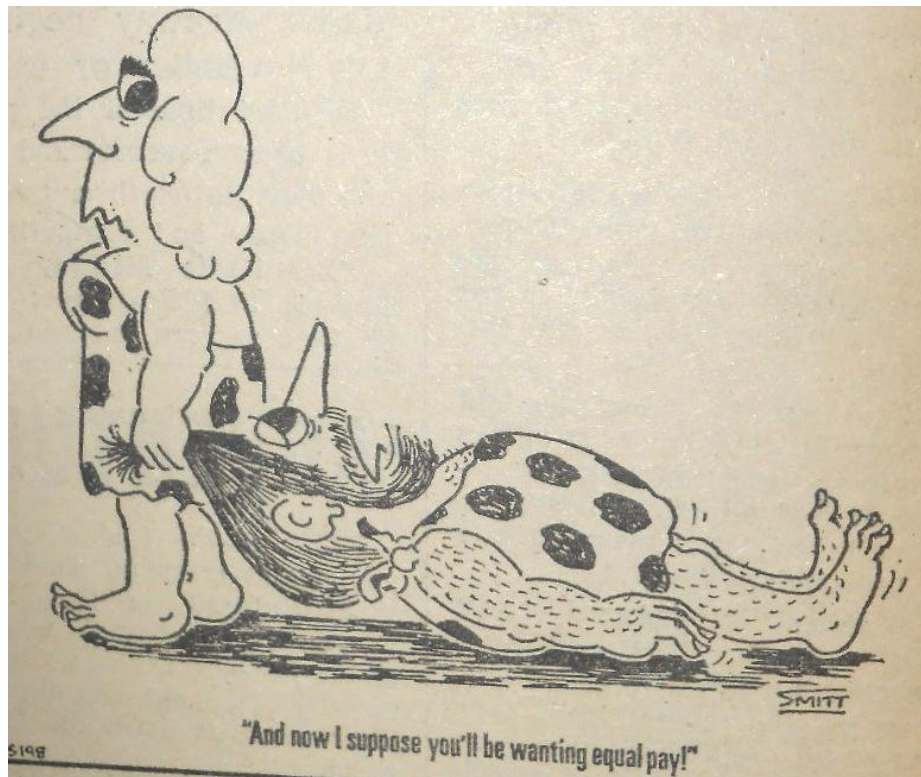


Figure 4.8: “And now I suppose you’ll be wanting equal pay!”. This cartoon by *Periscope* Cartoonist, Smitt, suggests a reversal of roles between men and women, rather than equality, relating to the Equal Pay Act. It shows the female assuming the likeness of a caveman traditionally attributed to chauvinistic males, perhaps echoing the concern among male workers that women were looking to emasculate them, but could also depict a female dragging her unwilling male counterpart into a new era where women are considered men’s equals.

Source: *Periscope* March 1975, p7.

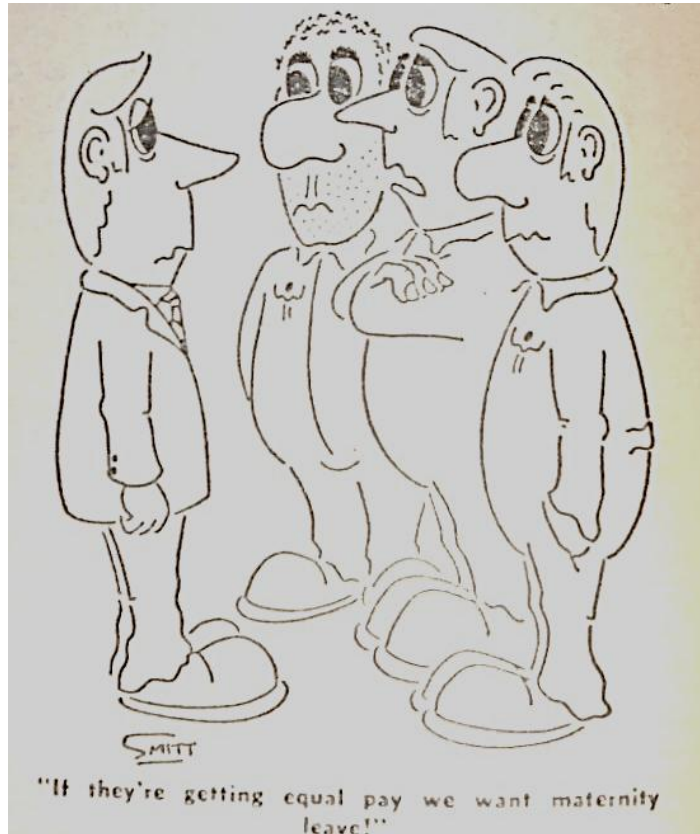


Figure 4.9: “If they’re getting equal pay we want maternity leave!”, also by Smitt, appears to be a satire on the dockyard worker’s perception of the unfairness of equal pay and maternity leave and perhaps the perceived opportunistic nature of some union demands. Interestingly, what was then obviously seen as a ludicrous request, is practically a reality now, as parental leave is beginning to offer a more gender equal solution to childcare.

Source: *Periscope* December 1970, p2.



Figure 4.10: Jackie Brown, ships' cleaner, photographed for Maid of the Month. Brown is photographed in overalls and hard hat, which was unusual. Source: *Periscope* August 1977, p1 (black and white).

Table 4.1
One Word Used to Describe Atmosphere and Culture within Chatham
Dockyard

Awesome	1
Brilliant	1
Busy	2
Content	1
Crap	1
Depressing	1
Determined	1
Excellent	1
Exciting	1
Family	7
Fascinating	1
Friendly/Friendship	7
Good	2
Great	3
Happy/Happiness	3
Matey	2
Non-motivational	1
Pride	1
Professionalism	1
Satisfying	2
Stupid	1
Thriving	1
Unique	2
Wonderful	1
Workman-like	1

Table 4.2
Environmental Allowances as at 1977

Allowance	Rate Payable	Overtime Treatment
Confined space	£0.04 ph	Flat Rate
Dangerous Employment	Over 2.0ft (6 metres) and up to 150 ft (46 metres) 50% time rate Over 150ft (46 metres) 100% time rate	Flat Rate
Foundry Allowance (also entitled to paid leave if regularly employed on the duty) – in recognition of the arduous nature of the working conditions existing in foundries	Founders £0.67 pw Founder Apprentices £0.42 pw Semi-skilled £0.45 pw Unskilled £0.33 pw	Premium Rate
Full Protective Clothing - where the wearing of special protective clothing and equipment causes serious discomfort	£0.11 ph	Flat Rate
Heat	£0.04 ph (above (90°F/32°C)) £0.15 ph (110°F (43°C) or more) Additional allowance of £0.15 ph for welders, shipwrights and iron caulkers for the time they are actually employed on pre-heated welding in compartments on HM Ships and Submarines where the air temperature registers 110°F (43°C) or more.	
Obnoxious conditions; exceptionally obnoxious conditions	£0.04 ph and £0.08 ph respectively	Flat Rate
Open Circuit Shotblasting – in recognition of the arduous and dirty nature of the work.	£0.15 ph	Flat Rate
Sewage Tank Cleaning	£0.15 ph	Flat Rate
Ship Tank Cleaning	£0.12 ph	Flat Rate
Submarine	£0.04 ph	Flat Rate

Source: RDL, Dockyard Industrial Memorandum No 4/77: Instructions Supplementing MOD Manual 9 – Chapter 8 – ALLOWANCES.

Chapter 5

Falling Out of Love with Asbestos

‘... adequate preventative measures were not introduced into Naval Dockyards until 1967. Variable amounts of asbestos debris were left scattered about the ships for most of the refit periods (sometimes up to 3 yr), because there was no defined procedure for clearing it away. As a result very large numbers of men have been exposed to asbestos dust by working with or near other men who were applying or removing asbestos materials, or because they were themselves disturbing asbestos debris and creating their own local dust clouds.’

Peter G. Harries, Medical Research Unit, HM Dockyard, Devonport, 1971.³⁸⁸
(see figure 5.1.)

The asbestos hazard was widespread across British industry by the late 1940s. As will be seen later in this chapter, asbestos was used in so many everyday objects that even the most unlikely employers could now be facing claims from asbestos victims. It should also be remembered that asbestos-related disease was not confined to workers in factories, shipyards and other industrial workplaces; it also affected domestic communities living in close proximity to asbestos mines and factories manufacturing the common industrial forms of the material. In some cases the wives and families of industrial workers have contracted asbestos-related illness through, for example, contaminated clothing being brought home for laundering or a lack of awareness leading workers to wear contaminated overalls³⁸⁹ in the home.³⁹⁰ Asbestos fibres have even been found in the tissues of still born babies.³⁹¹ One of the individuals consulted during this study, Mavis Nye, is currently battling mesothelioma thought to be contracted through laundering her husband’s work clothes.

³⁸⁸P.G. Harries ‘Asbestos Dust Concentrations in Ship Repairing: A Practical Approach to Improving Asbestos Hygiene in Naval Dockyards’ *Annals of Occupational Hygiene* 14 (1971), pp241-2. After an eventful naval career at sea, Harries was appointed assistant medical officer at Devonport Dockyard in 1964. Shortly after his appointment he began to see patients who were affected by asbestos but who were not registered asbestos workers. He later collaborated with chest physician Geoffrey Shears to study the effect of asbestos on workers at Devonport Dockyard, which was later extended to include all of the home Dockyards. During his research he was promoted to surgeon commander in 1966. He gained his MD from his research.

³⁸⁹ The overalls of Dockyard workers were not allowed to be taken off site and their laundering was arranged by the Dockyards. It was, however, still possible for fibres to enter the home on underclothes and in hair.

³⁹⁰ E. Crooks *The Factory Inspectors: A Legacy of the Industrial Revolution* (Stroud: Tempus Publishing, 2005) p193, 195-6.

³⁹¹ D. Gore and A. Sleator *House of Commons Research Paper 99/81: Asbestos* (House of Commons Library, 1999), p11.

Her husband Raymond worked at Chatham Dockyard. Despite the evidence pointing to the implications for those who were exposed to it and the precautions introduced over the years, asbestos has been a leading cause of occupationally-related deaths in the twentieth century and many of those exposed to the mineral dust in the 1960s, 70s and 80s are only now being diagnosed with asbestosis and mesothelioma. The Health and Safety executive (HSE) states that approximately 4,500 cancer deaths each year are due to past exposure to asbestos. In 2010, 2347 people died from mesothelioma, approximately 2,000 from asbestos-related lung cancer and asbestosis contributed to 412 deaths.³⁹²

This chapter is, however, concerned with one of the workplaces more obviously associated with asbestos: a Royal Dockyard. The use of the mineral in its most hazardous forms was profuse across the shipbuilding industry, particularly in the construction, repair and refitting of warships. Chatham Dockyard contributed to Medway's unenviable place as the region with the second highest rate of deaths caused by mesothelioma in England and Wales.³⁹³ Between 2002 and 2011, the MoD received 363 claims for asbestos-related disease from its former employees at Chatham Dockyard. Still more people suffered from exposure at the Dockyard, but did not claim against the MoD.

Dockyard workers are among the unfortunate groups of workers who were exposed to asbestos during the height of its use. The Admiralty did eventually put in place measures to protect all of its industrial workers, but these were too late for many. This chapter looks at the protection afforded to industrial workers in the Dockyards in the period 1945 to 1984, bearing in mind Harries' comments in the opening quote. It considers the background to the introduction of more widespread protection, including the introduction of alternatives to asbestos from the late 1960s and compares these measures with those required by law and those introduced by other organisations and navies in the period. Using Chatham Dockyard as a case study, it looks at the impact of asbestos-related disease on Dockyard workers and through empirical and documentary research, it asks whether the measures introduced were enough.

For the purpose of this study, two distinct periods have been identified in the history of the realisation of the asbestos hazard, with 1965 representing a turning point both in public awareness and in the Admiralty's treatment of the risk. The first period, prior to

³⁹² HSE *Health and Safety Statistics 2011/12* (www.hse.gov.uk).

³⁹³ British Uralite at Higham and the British Petroleum Oil Refinery on the Isle of Grain also played their part.

1965, relates to the official recognition of the danger to asbestos workers, who commonly had high and constant exposure to fibres over a prolonged period. They were most likely to develop asbestosis and/or asbestos-related cancers. The second period, after 1965, covers the official realisation that brief exposure to asbestos dust could also result in mesothelioma and asbestosis. This meant that many more workers were at risk than many people had appreciated, including neighbourhood workers, i.e. those who worked near asbestos but not directly with the material. It also included workers who, like those whose experiences have been recorded in this chapter, had transient exposure from work that involved asbestos packing, breaking lagging from around components they had to repair or simply doing their job surrounded by dust that had not yet been cleaned up. Management, including recorders and measurers and safety representatives, would also have been at risk when they visited areas where asbestos work was being or had been undertaken.

There is an abundance of information and discussion available from variously reliable sources. A range of secondary sources including books and journal articles has been researched. The historiography appears to be divided between those damning the actions (or inaction) of the government, unions and industry and a smaller number defending the asbestos industry. Professor Geoffrey Tweedale is an authority on the history of the asbestos industry and holds a vast collection of significant documents from the archives of Britain's largest asbestos manufacturer, Turner & Newall Limited (T&N), many of which provide damning evidence of the company's fight for survival at the expense of people's safety.³⁹⁴ *Magic Mineral to Killer Dust* has been a key point of reference for this chapter.³⁹⁵ Johnston and McIvor's authoritative work on asbestos-related disease in Scotland has provided some comparison between the action taken by the Admiralty and that taken by private shipbuilders and ship-repairers.³⁹⁶ Both Bartrip and Rachel Maines pit the life-saving properties of asbestos against the risk of disease, with the latter being a definite support for the continued use of asbestos in the USA.³⁹⁷ Maines' work has been particularly useful in its description of the uses of asbestos. Peter Bartrip's argument that

³⁹⁴Tweedale obtained the documents from Chase Manhattan Bank, which attempted to sue Turner & Newall in 1995 to recover costs for asbestos removal from its New York building; the case was unsuccessful.

³⁹⁵ Tweedale *Magic Mineral to Killer Dust*, p3.

³⁹⁶ Johnston and McIvor *Lethal Work*, pp91-2.

³⁹⁷P. Bartrip *The Way From Dusty Death: Turner and Newall and the Regulation of Occupational Health in the British Asbestos Industry, 1890s-1970* (London: The Athlone Press, 2001), p267; R. Maines *Asbestos & Fire: Technological Trade-offs and the Body at Risk* (New Brunswick: Rutgers University Press, 2005).

much writing on the tardy arrival of the Asbestos Industry Regulations, 1931, has relied heavily on hindsight to draw its conclusions, has provided an interesting point of reflection when considering whether the Admiralty acted soon enough to protect its workforce.³⁹⁸ It is worth noting that some authors of pro-asbestos books and articles were recruited by the asbestos industry. Bartrip received funding from T&N, Union Carbide and Armstrong Contracting & Supply for research into the history of asbestos and occupational health. He has also provided testimony in the US courts at the request of T&N's lawyers. In the introduction to *The Way From Dusty Death*, Bartrip acknowledges the funding and access to archival material he received from T&N, but states that the company did not seek to influence the direction or conclusions of his work.³⁹⁹ It is notable, however, that in contrast to Tweedale's work, which was not funded by asbestos manufacturers, Bartrip's findings are very sympathetic to the industry and he even goes so far as to label some writers who have criticised the manufacturers, factory inspectorate and government as zealots. Furthermore, he claims that academic writers who have drawn anti-industry conclusions have let anti-capitalist values influence their judgement.⁴⁰⁰ Even noted scientists such as Richard Doll, famed for his study that demonstrated the link between asbestos and cancer, have worked closely with asbestos manufacturers.⁴⁰¹

Empirical research for this chapter has included the review of available documents in the Admiralty, Civil Service Department and Ministry of Labour (MoL) files at the UK National Archives, Kew; review of documents from the T&N archive at Manchester Metropolitan University (the documents were released into the public domain as a result of litigation against T&N by Chase Manhattan Bank); analysis of death certificates for Chatham Dockyard workers held at Devonport Dockyard; attendance at coroners' inquest hearings; responses to questionnaires and interviews conducted with former employees of Chatham Dockyard; published legal reports from claims by or mentioning Dockyard workers; and published primary sources, specifically contemporary journal articles and local and national newspapers published in the 1960s and 1970s. Statistics were obtained

³⁹⁸P. Bartrip 'Too Little, Too Late: The Home Office and The Asbestos Industry Regulations, 1931' *Medical History* 42 (1998) pp421-438; Bartrip *The Way From Dusty Death*, pp2 & 265.

³⁹⁹ Bartrip *The Way From Dusty Death*, pvii.

⁴⁰⁰ Bartrip *The Way From Dusty Death*, pp271-2.

⁴⁰¹G. Tweedale 'The Rochdale Asbestos Cancer Studies and the Politics of Epidemiology: What You See Depends on Where You Sit' *International Journal of Occupational and Environmental Health* 13:1 (2007), p70.

from the UK Health & Safety Executive (HSE). Finally some miscellaneous records and documents were located at the Royal Dockyard Library, Chatham. These archives included pamphlets, manuals, internal memoranda, notices and other miscellany. Relevant websites were also consulted, including the HSE, National Health Service (NHS), personal injury lawyers specialising in asbestos-related disease and campaign sites, including the *Daily Mirror* Asbestos Time Bomb campaign. These sources were used to locate cases of ARDs among Dockyard workers.

A Matter of Time

*Unaffected by fire, unchanged by weather, untouched by time's dark captains rust, rot and decay, asbestos possesses rare qualities for which it stands alone.*⁴⁰²

Asbestos is the collective name for certain naturally occurring minerals with a wide range of strength, flexibility and quality of fibre. The name itself is derived from the Greek for inextinguishable or indestructible. Asbestos was considered a miracle material because of its soft and pliable nature as well as its ability to withstand heat, its strength and its resilience. It has been described as 'one of the most 'marvellous productions' of inorganic nature – 'a physical paradox' – that combined the properties of rock and silk and could be spun into strands that weighed less than an ounce to a hundred yards'.⁴⁰³

Asbestos is created as a result of pressures produced by shifting tectonic plates and is most useful to mankind in its fibrous form. Of the six types of asbestos, amosite (also known as grunerite or brown asbestos), crocidolite (blue asbestos) and chrysotile (serpentine or white asbestos) were widely used in industry. It was used for centuries and was mentioned in classic works by Pliny the Elder, Pausanias, Plutarch and Strabo.⁴⁰⁴ The Romans used it to make towels that could be cleaned by fire, the Egyptians used it as part of their embalming rituals and the Persians wrapped the bodies of their dead in asbestos cloth called vivum prior to cremation.

⁴⁰²*Asbestos: A Matter of Time* film by the US Bureau of Mines (US Ministry of the Interior) in co-operation with asbestos products company Johns Manville, 1959. Viewed using You Tube: <http://www.youtube.com/watch?v=LQeZmD7O9E>.

⁴⁰³Tweedale *Magic Mineral to Killer Dust*, p3.

⁴⁰⁴R. Maines *Asbestos & Fire*, p7.

The mineral also had its place in the Industrial Revolution, making an invaluable contribution to the development of the steam engine.⁴⁰⁵ The early history of Turner Brothers Asbestos Company Limited is indicative of the rise in the manufacturing of asbestos products during the late 19th Century.⁴⁰⁶ By 1918 Turner Brothers was mass producing asbestos cement products and introduced Lady Asbestos in its advertising (see figure 5.6). Designed by Bernard Partridge, she takes the form of a mythological warrior, wielding a shield, emblazoned with the word Asbestos, against the elements. Shipbuilding, Engineering, Building and Electricity, represented by god-like figures, relax high behind her, benefitting from her protection. Two years later one of the best known asbestos manufacturers, Turner & Newall Limited, was formed by the merger of Turner Brothers with J W Roberts Limited (manufacturers of textile and related products from crocidolite), Newalls Insulation Company Limited and The Washington Chemical Company Limited (producers of magnesium).⁴⁰⁷

During the 1940s and 1950s the use of asbestos expanded dramatically. It 'insulated steam pipes and power stations; it fireproofed offices and ships; it lined car brakes; distributed and filtered our beer and water; sheathed electrical cables; acoustically damped our cinemas; roofed our factories; and lined our oven mitts, toasters, and ironing boards'.⁴⁰⁸ During the Second World War its uses also included parachute flares, bazooka shells and torpedoes. Demand was such that national restrictions were placed on its use and asbestos manufacturers were declared controlled undertakings by the Ministry of Supply and their activities directed towards the war effort. In the 1950s it became a popular building material, as evidenced by contemporary publicity films. The opening quote to this section comes from one such film by the US Bureau of Mines in 1959, entitled *Asbestos: A Matter of Time*. The clever play on words indicating its fossil-like heritage, but also unwittingly alluding to the time bomb that its use would come to represent for the health of those mining it, working with it and even living near it.

The miracle mineral even earned fame from Marvel Comics in the form of the Asbestos Lady, a fire-starting bank robber who first appeared in 1947 and wore asbestos

⁴⁰⁵ Gore and Sleator *House of Commons Research Paper 99/81*, p9.

⁴⁰⁶ See Tweedale *Magic Mineral to Killer Dust* for more on the early history of T&N.

⁴⁰⁷ Monopolies Commission *A Report on the Supply of Asbestos and Certain Asbestos Products* (1973), p9.

⁴⁰⁸ Tweedale *Magic Mineral to Killer Dust*, pviii

lined clothing to protect her from the fires she started. But even this fictional villain eventually succumbed to mesothelioma after years of exposure to the mineral. The transition from the magic mineral helping to create a formidable villain in the 1940s to it becoming a fitting downfall for her in the 1990s illustrates the changing public perception of asbestos.⁴⁰⁹

The 1960s and 1970s saw mixed fortunes for the asbestos industry. Initially use of asbestos continued to be high, until from 1960 evidence began to be published of the dangers of the mineral dust to communities living near where asbestos was mined and manufactured and among neighbourhood workers.⁴¹⁰ Increasing restrictions in its application and removal combined with efforts to find alternatives began after that time. In the UK the Asbestos Regulations, 1969, expanded restrictions and requirements for protective measures to be introduced by employers and manufacturers. The Health & Safety At Work Act, 1974 (HSWA) brought more workers under the protection of the law and also increased responsibility of industry to the public. Moreover, it stated that workers also had a responsibility for their own health and safety at work. The HSWA applied to asbestos as much as any other workplace hazard.

The import of blue and brown asbestos to the United Kingdom was banned in 1985. White asbestos was still imported until 1999 and its use permitted until 2005. Although its use is much reduced today, the mineral is still mined: in 2009 Russia was the biggest producer of asbestos with 50% of the world share followed by China (14%), Brazil (12.5%), Kazakhstan (10.5%) and Canada (9%).⁴¹¹

Before discussing the threat that asbestos poses in detail, it should be acknowledged that the material has been responsible for protecting life too. Much of Maines' work deals with the life-saving properties of asbestos and suggests that the benefits of the material outweigh its risks. Her introduction states that in the US 'more *children* died every year from fire, before we built the fire safety system that includes asbestos, than *adults* are now

⁴⁰⁹ <http://www.comicvine.com/asbestos-lady/4005-43702/> (accessed January 2012) and *The Invaders: Never Before Revealed the Untold Origin of Toro!* (Marvel Comics, November 1977).

⁴¹⁰ Neighbourhood workers is the term commonly used to describe those who worked in the vicinity of asbestos work, but not with the material itself or those who had intermittent exposure, such as plumbers breaking asbestos lagging away from pipes they had to replace.

⁴¹¹ M. Ross and R.P. Nolan 'History of asbestos discovery and use and asbestos-related disease in context with the occurrence of asbestos within the ophiolite complexes' in Y. Dilek *Ophiolite Concept and the Evolution of Geological Thought* Geological Society of America Special Publication 373.

dying from asbestos-diseases'.⁴¹² Its use in the insulation of warships against fire is detailed below. She later suggests that thousands of lives were saved by the introduction of asbestos fire curtains in theatres, asbestos protected motion-picture projection booths and asbestos used in homes, for example in ceiling tiles and roofs. She does not, however, spend much time looking at the other uses to which asbestos was put, i.e. the fuel-saving insulation in ships' engine rooms. It would be hard to convince many that economy drives such as this were worth the lives blighted by asbestos. Of course, the life-saving merits of asbestos are no excuse for a lack of protection of people working with the material. Where Maines fails to consider the issue, this case-study discusses the impact and cause of workers' exposure to the dangerous fibres.

Asbestos use in the Royal Dockyards

...as an industry the Navy uses large amounts of many different products using asbestos in varied and difficult working conditions.

Peter G. Harries, 1968⁴¹³

Asbestos was used to insulate warships against fire, both accidental and from enemy action; Bartrip has even gone so far as to argue that given its 'use by the Royal Navy at the height of the Cold War it is reasonable to assert that [asbestos] had a role to play in national security'.⁴¹⁴ The Safety of Life At Sea Convention (SOLAS), 1960, required fireproofing on ships and though asbestos was not prescribed, a Board of Trade official argued in 1967 that only asbestos materials would pass its stringent fire tests.⁴¹⁵ According to Johnston and McIvor, it was a requirement of fire regulations that asbestos be used to insulate ships' boilers into the 1970s.⁴¹⁶ The horror of fire on board ships is described in Barnaby's *Some Ship Disasters and their Causes*.⁴¹⁷ Though the 14 casualties mentioned were merchant ships, the potential for loss of life was not so much different aboard a warship. Even

⁴¹² Maines *Asbestos & Fire*, p12.

⁴¹³ P.G. Harries 'Asbestos Hazards in Naval Dockyards' *Annals of Occupational Hygiene* 11 (1968), p140.

⁴¹⁴ Bartrip *The Way From Dusty Death*, p206.

⁴¹⁵ Bartrip *The Way From Dusty Death*, p206.

⁴¹⁶ Johnston and McIvor *Lethal Work*, pp79-80.

⁴¹⁷ K.C. Barnaby *Some Ship Disasters and their Causes* (New York: A. S. Barnes and Company, 1973)

aboard a steel ship, once a fire had taken hold it was almost impossible to control.⁴¹⁸ Maines cited the seriousness of fire aboard naval vessels and asbestos' part in reducing the risk.⁴¹⁹ Probably the most famous victim of burns during a fire on a British naval vessel was Simon Weston. He received 46% burns on his body in 1982 when the RFA *Sir Galahad* was destroyed at Bluff Cove during the Falklands War.⁴²⁰

Asbestos insulated bulkheads and deckheads in order to contain fire. Insulation to the electrical wiring, cooking and heating facilities and machinery, which could make a fire more serious, also became standard. Additionally, asbestos was used as sound insulation and served to conserve fuel use through insulation of boilers, pipes and valves. Asbestos was used for insulation purposes in naval ships from circa 1880. Until 1947 contractors undertook all major asbestos lagging work within the Dockyards, while Dockyard ladders were generally only involved in localised repairs.⁴²¹ After this time the Dockyards employed their own sprayers, often recruited from the paint departments. A particular grade of crocidolite, RB2, was used in the SLA used on naval vessels until 1948, after which time this was substituted for a mixture containing RW2 grade chrysotile instead. This decision was taken after the two SLA mixtures were trialled on board HMS *Ben Lomond*. Despite the crocidolite mixture proving to be the superior product, the Admiralty opted for chrysotile.⁴²² Asbestos was applied to bulkheads and deckheads by spraying until 1963, after which time it was replaced with glass fibre. The cessation of asbestos spraying at this time was, however, due to issues with the weight of ships rather than any concern for workers' health.⁴²³ Beyond spraying, lagging and sound insulation, there were many other minor processes that involved the fitting or removal of asbestos materials, including sawing and fitting friable asbestos board for ironing boards, prevention of abrasion in components and cleaning (often with wire brushes) of pipes and glands previously lagged with asbestos.

⁴¹⁸Barnaby *Some Ship Disasters*, p227.

⁴¹⁹ Maines *Asbestos & Fire*, p91.

⁴²⁰ See S. Weston *Walking Tall* (London: Bloomsbury Publishing Limited, 1989).

⁴²¹TNA, LAB 105/11 *Medical Services: survey of asbestos workers: correspondence relating to industrial workers Ministry of Defence, Royal Naval Dockyard, Devonport, 1972*, appendix to report by P. G. Harries on Asbestosis Survey at Devonport.

⁴²² Bartrip *The Way From Dusty Death*, p325.

⁴²³ Harries 'Asbestos Hazards in Naval Dockyards', p136.

Figure 5.5 shows the engines of HMS *Vidal*, a diesel powered survey ship built at Chatham Dockyard in 1951.⁴²⁴ Two types of asbestos insulation can be seen clearly. Firstly, a large cast-like section of asbestos lagging, which was applied in paste form to chicken wire over the pipe and which had to be broken off before any refit or repairs could be undertaken. Secondly, smaller sections of asbestos mattress can be seen and these were fitted and removed using hook and eye fastenings.⁴²⁵ It should be noted that diesel engines had far less asbestos insulation on them than coal or oil fired engines, because they did not have so many hot components. Informal interviews with former Chatham Dockyard workers have been very helpful in understanding how widespread the use of asbestos was on board ships in the 1950s and 1960s. Those who helped were volunteers from the Chatham Dockyard Historical Society (CDHS) and the Chatham Historic Dockyard Trust (CHDT). All were neighbourhood workers. Fitter Phillip Lewing worked afloat with asbestos between 1961 and 1968. He typically worked in engine rooms, boiler rooms, steering compartments and on propellers and shafting when vessels were in dry dock. He listed the components that he would have worked on:

... Feed water pumps, turbo forced draught blower, turbo generators, boiler safety valves in the boiler room, main turbines, exhaust systems and associated valves in the engine room, as well [as] capstans. All steam driven.⁴²⁶

Lewing explained that entire gas turbines, which were intricate and irregularly shaped, would be covered in asbestos; the larger parts with asbestos board, which would be sealed and smaller parts covered with a paste made from asbestos and water that hardened when it dried, like that shown in the photograph of HMS *Vidal*'s engine (figure 5.5).⁴²⁷ Joints, couplings, flanges and valves were among the components that would be insulated in this way. It is this hard casing that workers would often break off with chipping hammers in

⁴²⁴ Courtesy of Chatham Historic Dockyard Trust.

⁴²⁵ Informal interview with Phillip Lewing 20 April 2011, Chatham Dockyard.

⁴²⁶ Short questionnaire response: Phillip Lewing.

⁴²⁷ Informal interview with Phillip Lewing.

order to repair or replace the components beneath. Lewing said that a well lagged boiler or turbine would look clean, smooth and white; a thing of beauty in its own way.⁴²⁸

Engine fitters Brian Jenkins and Joe Bond described the types of work they would do afloat, ranging from mending steam washing machines aboard cruisers to fitting pipes anywhere on a ship or working in a ship's engine or boiler rooms. They explained that asbestos was also used to prevent water leakage and to stop abrasions in joints and cocks. Where parts had moving components asbestos in its fibrous form was used to 'pack' gaps between the components and to stop damage from abrasion. Apprentices (i.e. young men typically 16 to 18 years of age) carried out the job of packing asbestos; restrictions that prevented young people from working with asbestos under the 1960 Shipbuilding and Ship-Repairing Regulations did not extend to this type of work. They would roll the asbestos between their fingers to compress it and then pack it in the gaps around components using a brass tool that resembled a pencil.⁴²⁹ Referred to by the MoD as high temperature jointing and packing materials, this compressed asbestos fibre was listed as non-hazardous in 1970 (see table 5.11). Prefabricated sheets of asbestos were also used as linings between flanges and valves. Pieces of the material were obtained from the storeman, who would break off a section from a larger piece and the tradesman would then break it into shape with a hammer and make holes for any screws or bolts. These accounts of asbestos use are echoed in testimony from other former Dockyard workers found in newspaper articles, inquest reports and court reports. Table 5.1 shows the extent of the use of asbestos materials in the Dockyards.

In a paper presented to the Department of Occupational Medicine in Newcastle in 1968, Harries opined that exposure to asbestos was likely to be higher in the Dockyards than in private shipyards. This was partly because the Dockyards were engaged in the refitting and repairing of ships, which often involved extensive removal of asbestos lagging and which gave rise to more dust than its application.⁴³⁰ Moreover, between 1944 and 1963 (the period when many of the workers mentioned in this chapter were working at Chatham Dockyard), crocidolite was used extensively in environmental insulation⁴³¹ for

⁴²⁸ Informal interview with Phillip Lewing.

⁴²⁹ Informal interview with Brian Jenkins, 14 April 2011, Chatham Dockyard.

⁴³⁰ Harries 'Asbestos Hazards in Naval Dockyards', p136.

⁴³¹ Environmental insulation was used to provide a reasonable temperature inside the ship and also to minimise the spread of fire.

naval vessels and between 1950 and 1963 amosite use was increased in order to provide more efficient insulation. From 1963 to the time Harries gave his paper, amosite lagging was still being used in small sections, but calcium silicate sections containing less amosite also began to be used.⁴³² From 1967 onwards alternatives to asbestos were sought by the Admiralty. (It should be noted that alternative fire retardant products, such as mineral wool and rock wool, were already in use from the late nineteenth century. McCulloch and Tweedale have argued that it was asbestos' cost effectiveness that made it so popular across the world.)⁴³³ By 1969, there had been an 80% reduction in the use of asbestos in new vessels.⁴³⁴ This active reduction in the use of asbestos would have little immediate benefit for Dockyard workers, however, as old materials would still need to be removed from vessels in refit and repair for many years to come. This fact was acknowledged in 1978 by the Parliamentary Under Secretary of State for Defence (Navy), Patrick Duffy.⁴³⁵

Harries listed asbestos mattress workers, ladders, sailmakers working with asbestos cloth, asbestos sprayers and strippers and storemen as those most obviously at risk from the hazards of asbestos, but he added that 'many other men have been at risk'.⁴³⁶ These included tradesmen applying and removing small amounts of asbestos during their everyday work, neighbourhood workers and management. Most at risk were those who worked in machinery spaces, engine rooms and boiler rooms, as this was where asbestos was predominantly applied and removed. These spaces also had little ventilation.

Realisation of the Hazard

The diseases associated with asbestos predominantly affect the lungs and abdominal cavity and are caused through inhalation of the mineral's fibres.⁴³⁷ See Appendix 1 for details of the individual conditions (referred to collectively hereafter as ARD (asbestos-related

⁴³²Harries 'Asbestos Hazards in Naval Dockyards', p136.

⁴³³ J. McCulloch and G. Tweedale *Defending the Indefensible: The Global Asbestos Industry and its Fight for Survival* (Oxford: OUP, 2008), p23.

⁴³⁴ TNA, BA 27/318: Letter to J. A. Patterson, HM Treasury from M. M. Du Merton, Naval Law Division, 7 January 1969

⁴³⁵Hansard (Commons) Vol 941 Col 634 (Written Answers) 9 January 1978.

⁴³⁶Harries 'Asbestos Hazards in Naval Dockyards', p138.

⁴³⁷ For details of the different conditions caused by asbestos fibres see: National Health Service (NHS) website: <http://www.nhs.uk>; Mesothelioma UK *What is Mesothelioma?* (Leicester, Mesothelioma UK: 2010); Health & Safety Executive (HSE) website: <http://www.hse.gov.uk/statistics/causdis/pleural/>.

disease)). Bob Smith's case in Alan Dalton's *Asbestos Killer Dust* enabled some empathy with the asbestosis sufferer:

My fingers swell up and my ankles. When I try and grip anything, I get an ache ... I can't carry anything like a box or a suitcase and I get out of breath with the slightest exertion. Sometimes I get a terrific coughing bout and the wife has to hit my back ... it's like someone getting hold of you and gripping you tight and when she hits me across the back it releases, and then I get the pain. It's gradually getting worse. I am down from 11½ to 8 stone. I used to eat five meals a day but now I can't eat five meals in a fortnight. If I eat too much I bring it back up again.⁴³⁸

The moral injustice of the widespread exposure of workers to asbestos without proper health warnings and protection has been long argued, given that risks began to be realised by the late nineteenth century. In 1898, the report of the Lady Inspectors of Factories contained the reference (in Britain) to the health risk of asbestos work as one of four 'dusty occupations which specially came under observation ... on account of their easily demonstrated danger to the health of workers'. Lucy Deane, Factory Inspector, noted:

The evil effects of asbestos dust have also attracted my attention, a microscopic examination of this mineral dust which was made by H.M. Medical Inspector [Dr Thomas Legge] clearly revealed the sharp, glass-like, jagged nature of the particles, and where they are allowed to rise and remain suspended in the air of a room, in any quantity, the effects have been found to be injurious, as might have been expected.⁴³⁹

1900 saw the first recorded fatality caused by fibrosis of the lung in an asbestos worker. The 33-year-old was admitted to the Charing Cross Hospital in 1899 with breathlessness and told his Physician, Montague Murray, that he had worked in the asbestos industry for 14 years and that he was the last survivor of ten in his workroom. When he died a post-mortem conducted by Murray found that his lungs were stiff and black from fibrosis.⁴⁴⁰ Later, in 1906, Monsieur Auribault, a French factory inspector reported circa 50 deaths

⁴³⁸ A. Dalton *Asbestos Killer Dust: A worker/community guide: how to fight the hazards of asbestos and its substitutes* (London: BSSS Publications, 1979) p23.

⁴³⁹ Bartrip 'Too Little, Too Late: The Home Office and The Asbestos Industry Regulations 1931', p423.

⁴⁴⁰ Tweedale *Magic Mineral to Killer Dust* pvii.

among female asbestos textile workers.⁴⁴¹ The Factory Inspectorate's Medical Inspector's Annual Report for 1910, as sent to Winston Churchill in his capacity as Secretary of State for the Home Department, observed that in a period of five years 40 workers in a factory where asbestos was woven had suffered phthisis (tuberculosis). The first inquest into the death of an asbestos worker was held following the death of Nellie Kershaw in 1924. She was an asbestos spinner for T&N and hers was the first recorded case of asbestosis. The toxicity of asbestos to the pleura, lungs and airways was accepted after 1926.⁴⁴² In 1928 the government commissioned a study of workers' health in the asbestos textile industry. Dr Edward Merewether, a Medical Inspector of Factories and Charles Price, an Engineering Inspector of Factories, conducted the study and published a report of their findings in 1930. Recognised today as a classic work on occupational health, it meant that Britain was the first nation to officially recognise asbestosis.⁴⁴³ Although covering just one section of asbestos workers and even then only a sample of those who were working in the industry, the findings of the study convinced the Government of the occurrence of asbestosis and prompted a three-pronged initiative to address the risk. The speedy response to the report has been argued to be an indication that the Government acknowledged its inaction in the preceding years.⁴⁴⁴

Firstly, a Medical Arrangements Scheme was set up to screen new employees and monitor them on an annual basis. The second prong was an Asbestos Scheme, whereby those disabled by asbestosis would be compensated by the industry and the dependents of those who had died from the condition would receive a lump sum death benefit, which brought the asbestos industry within the Workmen's Compensation Act. The third was the establishment of the Asbestos Industry Regulations, 1931. At the time, the asbestos industry was one of few industries that had been subjected to specific regulations. They provided some precautionary measures aimed at controlling dust and applied to all factories and workshops using processes involving the breaking, crushing and mixing of asbestos

⁴⁴¹C. Booker and R. North (eds) *Scared To Death: From BSE to Global Warming: Why Scares Are Costing Us the Earth* (London: Continuum, 2007) p281.

⁴⁴²R. Bégin 'Asbestos-related lung diseases' in D. Banks and J. Parker (eds) *Occupational Lung Disease: An international perspective* (London: Chapman & Hall Medical, 1998).

⁴⁴³ For further detail on Merewether and Price's Study see Tweedale *Magic Mineral to Killer Dust* pp20-22.

⁴⁴⁴ M. Greenberg and N. Wikeley 'Too little, too late? The Home Office and the Asbestos Industry Regulations, 1931: A Reply' *Medical History* 43 (1999), p510.

insulating slabs or sections and the making or repairing of asbestos mattresses.⁴⁴⁵ They required that exhaust ventilation be installed and that workshops be kept clean and adequately lit. Impermeable sacks were introduced for the storage of asbestos. Overalls and masks would be used for the dustiest operations and some attempt was made to protect bystanders and young workers. The 1931 Regulations and the Medical and Asbestos schemes remained largely unaltered until 1969.

Meanwhile, in August 1945 Sir Wilfred Garrett, HM Chief Inspector of Factories, wrote to 23 individuals and organisations connected with the shipbuilding and ship-repairing industries with his concerns over the increased use of asbestos during the Second World War. Garrett highlighted the increased risk this would pose to workers' health and, after warning that statutory intervention may be needed, he went on to suggest how workers could be protected, including measures to be taken for men working on board ships. He recommended that men under the age of 18 be prohibited from working with asbestos.⁴⁴⁶ It is probable that the Admiralty had sight of the letter. The organisations that Garrett targeted certainly included the unions and confederations of unions that represented Dockyard workers, including the trades that Harries would later reveal to be exposed to asbestos in their work and found to be contracting ARDs, but who were not recognised asbestos workers. Among the recipients of the letter was J. S. Boyd, who, it is assumed, was Sir John Smith Boyd, who worked on the Admiralty Central Consultative Committee Essential Work (Shipbuilding) Order, 1941-45 and the Royal Commission on Workmen's Compensation 1939-45. Garret's letter has been used by personal injury lawyers, since at least 1971, in claims against private shipbuilders and ship repairers as well as the Ministry of Defence to prove that a certain level of risk was or should have been known by 1945. Indeed, circa 1984, HM Factory Inspector, Mr Simpson Evans, commented:

Trying to adopt the most charitable view towards shipbuilding employers...they must certainly have known or should have known of risk to health from asbestos dust in the air for their employees by 1945.⁴⁴⁷

T&N objected to point 3 in the letter, which concerned the use of respirators:

⁴⁴⁵ "Mattresses" referred to prefabricated insulating sections, which were used in ships.

⁴⁴⁶ TNA, LAB 14/2740 Letter from A W Garrett, HM Chief Inspector of Factories to various organisations connected with shipbuilding and ship-repairing August 1945.

⁴⁴⁷ <http://www.alancare.com/asbestosuk/lsekse.html>

... the suggestion that workmen engaged in fitting or removing any dry insulation material containing asbestos on board ship ... was in our view quite unnecessary and inappropriate, and that if any such action were imposed in that manner it would mean in effect a very wide extension to the Asbestos Regulations ... our experience in the past had shown that no cases of asbestosis have arisen amongst employees handling and applying finished products.⁴⁴⁸

T&N objected particularly to the suggestion that the Asbestos Regulations be extended to manufactured (or finished) products and the potential effect that the letter could have on demand for them.

The contents of Garret's letter were echoed in the draft Shipbuilding and Ship-Repairing Regulations. Efforts to bring these regulations up-to-date, including measures to address the asbestos hazard, began in 1950, but were severely delayed. The draft regulations were circulated to interested parties including trade associations and trade unions and, notably, asbestos manufacturers, including The Cape Asbestos Company Limited (Cape) and T&N. The initial draft included a clause requiring respirators to be provided for workers 'in the vicinity of any work that gave off hazardous dust ...'⁴⁴⁹ The asbestos manufacturers exerted pressure to change the clause. In a letter to the MoL dated 14 March 1958, Cape's Commercial Manager claimed that there was 'no evidence available to us whatsoever that work in the vicinity [of asbestos spraying] is in the slightest degree endangered'.⁴⁵⁰ T&N was concerned that this would apply not only to its own employees, 'but to men in all other trades working on board ship, which would no doubt have caused continual difficulties with other Contractors and with the Shipbuilders and may well have led to a substantial loss of asbestos insulation business'. T&N wrote to the MoL regarding the draft definition of asbestos and draft regulations 70 and 71. The company complained that the definition was too wide and ambiguous. It requested that it be 'limited to the use and application of the fibre itself in its raw and dry unmanufactured state, and that to prevent misunderstanding the definition should show that manufactured goods are completely excluded from the definition'.⁴⁵¹ The manufacturers were victorious; all mention

⁴⁴⁸T&NA, letter from T&N's Secretary to the Ministry of Labour and National Service, 6 December 1950, p2.

⁴⁴⁹ Johnston and McIvor *Lethal Work*, p125.

⁴⁵⁰ TNA, LAB 14/2581 letter from Commercial Manager, Cape Asbestos Company Ltd to Ministry of Labour and National Service, 14 March 1958.

⁴⁵¹T&NA, letter from T&N's Secretary to the Ministry of Labour and National Service, 6 December 1950, p2.

of workers in the vicinity of asbestos work (except asbestos spraying) was removed and the definition was amended in the final asbestos section (see Annex 2). T&N reported back to its board when the second draft of the regulations was circulated by the MoL:

I'm glad to be able to inform the Board that our efforts to improve the wording of the Regulations so as to limit the obligations placed on the Insulation Industry have been very successful. Our two main objections to the original Regulations have now completely disappeared consequent on the revision now made.⁴⁵²

Thus it appears that protection that may have prevented thousands of workers from contracting ARDs failed to be introduced in order to protect asbestos manufacturers and employers from extra costs and loss of business.

Asbestos-related lung cancer was acknowledged as early as 1934⁴⁵³ and by the end of the 1930s the Factory Inspectorate was flagging the link. In 1953, Factory Inspector McLaughlin listed asbestos as a lung carcinogen in the *Lancet*.⁴⁵⁴ It was not until 1955, however, following publication of the first mortality studies, that a direct connection between asbestos and lung cancer was formally acknowledged. In 1955 Richard Doll published the results of his epidemiological study of asbestos workers, which confirmed the link.⁴⁵⁵ Despite the fact that interested parties, such as asbestos manufacturers and their medical advisers, plus the factory inspectorate were alive to the lung cancer link, it was some time before general practitioners became aware of it. Johnston and McIvor describe this as a two-tier system of knowledge⁴⁵⁶, which was prolonged by the fact that asbestos-related lung cancer did not become a prescribed disease until April 1985 and even then it was only compensable when accompanied by asbestosis (presumably because it is difficult to differentiate from lung cancer caused by other factors, such as smoking). Asbestos-related tumours were increasingly diagnosed in the 1960s and by the mid-1960s 'over half those seeking compensation for asbestosis were found to have a tumour of the lung too'.⁴⁵⁷ Despite growing numbers of asbestos-related fatalities during the 1940s and 1950s, the

⁴⁵² T&NA, Minutes of Board Meeting of Turner & Newall Limited held 26 June 1958, p1.

⁴⁵³ Tweedale *Magic Mineral to Killer Dust* p141

⁴⁵⁴ Tweedale *Defending the Indefensible*, p73.

⁴⁵⁵ R. Doll 'Mortality from Lung Cancer in Asbestos Workers' *British Journal of Industrial Medicine* 12:2 (April 1955).

⁴⁵⁶ Johnston and McIvor *Lethal Work*, pp114-5.

⁴⁵⁷ Johnston and McIvor *Lethal Work*, p.115.

industry expanded, with asbestos being employed for the many and various uses described at the beginning of this chapter.

The link between asbestos and mesothelioma was first recorded in 1960 following a study in South Africa by J. C. Wagner *et al*, which found that of 33 patients with the condition, 32 had been in contact with crocidolite. The findings of this research were echoed in studies by Irving Selikoff and E. Hammond in New York (1964) and Muriel Newhouse and Hilda Thompson in London (1965).⁴⁵⁸ Before 1960, mesothelioma was commonly regarded among pathologists as a rare condition and also as a secondary cancer, i.e. a metastasis of a primary tumour elsewhere in the body. The latter of these studies acknowledged that it was not only those who worked directly with asbestos but those in the vicinity during its use (i.e. neighbourhood workers) who were exposed to its dangers. In October 1964, the International Union Against Cancer (IUAC) called for research into the risk of incidental exposure to asbestos, mentioning the shipbuilding industry specifically.⁴⁵⁹ Selikoff also warned in 1964 that:

The floating fibres [of asbestos] do not respect job classifications. Thus, for example, insulation workers undoubtedly share their exposure with ... electricians, plumbers, sheet-metal workers, steamfitters, laborers, carpenters, boiler makers, and foremen; perhaps even the supervising architect should be included.⁴⁶⁰

Three months later, on 31 October 1965, the *Sunday Times* Medical Correspondent, Dr Alfred Byrne, reported Newhouse and Thompson's finding that people living up to half a mile away from the Cape Asbestos factory in Barking had died from mesothelioma and also that relatives of workers had contracted the disease through exposure to fibres brought into the home.⁴⁶¹ This article is considered a watershed in the history of the asbestos hazard by which personal injury claims are judged. The precedent was set in 2007, when the Senior

⁴⁵⁸ J.R. Wagner *et al* 'Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province' *British Journal of Industrial Medicine* 17:4 (October 1960); I. Selikoff and E. Hammond. 'Asbestos Exposure and Neoplasia' *The Journal of the American Medical Association* 188:1 (April 1964); M. Newhouse and H. Thompson 'Mesothelioma of the Pleura and Peritoneum Following Exposure to Asbestos in the London Area' *British Journal of Industrial Medicine* 22:4 (October 1965).

⁴⁵⁹ International Union Against Cancer 'The Association of Exposure to Asbestos Dust and Cancer: A Report from a Working Group of the International Union Against Cancer' *Annals of Occupational Hygiene* 8:3 (July 1965), pp268-9.

⁴⁶⁰ Quoted in Tweedale 'The Rochdale Asbestos Cancer Studies', p74.

⁴⁶¹ A. Byrne 'Scientists track down a killer dust disease' *The Sunday Times* 31 October 1965.

Civil Judge at Cardiff County Court ruled that Metal Box Limited should have eliminated asbestos dust in their factory within eight months at most of the article being published, despite the company claiming it was not aware of the asbestos hazard until 1968.⁴⁶² The attempt by asbestos industry physicians to play down the dangers of asbestos cargo handling by dock workers became public in 1966.⁴⁶³ Mesothelioma was added to the list of prescribed diseases in the same year and the British Mesothelioma Register was established in 1967 to record all deaths where mesothelioma was recorded on the death certificate as the cause.

The Asbestos Regulations, 1969, came into effect on 14 May 1970, following a rise in the number of asbestosis cases and recognition that the risk of ARDs stretched beyond the asbestos workers that the previous act had protected; the removal of the word ‘Industry’ from the title of the regulations signified comprehension of this fact.⁴⁶⁴ The first quantitative limits for dust concentrations were set: 0.2 f/cc for crocidolite and 2 f/cc for chrysotile. The limit for crocidolite reflected the government’s (and asbestos manufacturers’) misleading view that it was solely responsible for mesothelioma. It was virtually unattainable, thus this form of asbestos was effectively legislated out of the UK market.⁴⁶⁵

Public awareness of the dangers of asbestos increased significantly from the late 1960s. Johnston and McIvor refer to the ‘rising media coverage exploiting ... accumulating medical evidence – including several TV exposés of the asbestos issue’ and state that few could be unaware of the dangers of asbestos by the late 1970s.⁴⁶⁶ Cape’s Acre Mill factory at Hebden Bridge gained infamy when it was revealed that 12% of its circa 2,200 workers had died or were suffering from ARD. Tweedale has argued that the persistent news coverage of the health disaster ‘demonstrated that although chronic

⁴⁶² <http://www.thompsons.law.co.uk/ltxt/lb0907-new-asbestos-watershead.htm>

⁴⁶³ M. Greenberg ‘The Doctors and the Dockers’ *American Journal of Industrial Medicine* 45 (2003), p577.

⁴⁶⁴ See Bartrip *The Way From Dusty Death*, pp259-60 for details of the requirements introduced by the Asbestos Regulations, 1969.

⁴⁶⁵ Tweedale *Magic Mineral to Killer Dust*, p207 and G. Tweedale ‘Sprayed “Limpet” Asbestos: Technical, Commercial, and Regulatory Aspects’ in G. Peters and B. J. Peters *Sourcebook on Asbestos Diseases* Vol 20 (USA: Lexis Law Publishing, 1999), p94.

⁴⁶⁶ Johnston and McIvor *Lethal Work*, p118-9.

occupational diseases have a low profile, once they develop on a large enough scale they do not quickly disappear'.⁴⁶⁷

A 'recognisable anti-asbestos lobby' and the first asbestos campaign groups had also appeared by the late 1970s.⁴⁶⁸ In 1979, Dalton published *Asbestos Killer Dust* in association with the British Society for Social Responsibility in Science.⁴⁶⁹ Dalton criticised Dr Robert Murray for his lack of action after inspecting the Hebden Bridge site as Medical Inspector of Factories in 1949 and 1952. He also referred to Murray's part in producing a leaflet for London dockers that played down the risk of handling asbestos cargoes and to Murray testifying for a US asbestos company against ARD claims.⁴⁷⁰ Dalton was successfully sued for libel by Murray and the court costs he was made to pay left him bankrupt. After Murray died, it was discovered that he had been paid as an adviser to the asbestos industry and that at least some of what Dalton had claimed had been true.⁴⁷¹ The book itself was still sold, though the offending paragraphs were removed.

In 1982 the Yorkshire Television documentary *Alice – A Fight for Life* provided a heart wrenching account of 47 year old Alice's fight against mesothelioma and also for her rights against her former employer. The impact of the documentary was not lost on the asbestos manufacturers. The industry's public relations man said 'Until the Alice film the various programmes on asbestos made since 1975 had little lasting impact on either the public or the industry... [but Alice] was a different kettle of fish. It was a highly personalised, very emotional, tragic record of one person's suffering. It was two years in the making and was, to put it mildly, a blockbuster'.⁴⁷² It adversely affected T&N's share price and generated national outrage.

Nancy Tait was described in her obituary as a 'tenacious campaigner for the victims of asbestos diseases'.⁴⁷³ Her campaign started after she lost her husband Bill, a Post Office Engineer, to mesothelioma in 1968. She helped thousands of victims of ARDs and their

⁴⁶⁷ Tweedale *Magic Mineral to Killer Dust*, p240.

⁴⁶⁸ Castleman and Tweedale 'Turning the Tide' in Sellers and Melling (eds) *Dangerous Trade*, p187.

⁴⁶⁹ A. Dalton *Asbestos: Killer Dust - A Worker/ Community Guide on How to Fight the Hazards of Asbestos and Its Substitutes* (London: BSSRS, 1979).

⁴⁷⁰ Dalton *Asbestos: Killer Dust*, pp90-1.

⁴⁷¹ See also Greenberg 'The Doctors and the Dockers' for Murray's part in the London dockers issue.

⁴⁷² G. Tweedale 'Straws in the wind: the local and regional roots of an occupational disease epidemic' *Business in the North West - Manchester Region History Review* 21 (2010), p157.

⁴⁷³ *The Guardian* 23 February 2009 <http://www.guardian.co.uk/society/2009/feb/23/nancy-tait>.

families and raised public awareness by lobbying MPs, civil servants and union leaders. She published a booklet titled *Asbestos Kills* in 1976,⁴⁷⁴ which generated media interest. Two years later she founded the Society for the Prevention of Asbestosis and Industrial Diseases (SPAID). She campaigned to raise awareness of the risk that asbestos posed to all workers (not just asbestos-industry workers) and the public. She also campaigned against the false belief that white asbestos was safe, though its use persisted in the UK until 2005.

Asbestos-related disease among Dockyard workers

The Admiralty was galvanised into action against the dangers of asbestos in the late 1960s, following receipt, in July 1965, of a letter from Devonport Dockyard's senior medical officer, Surgeon Commander K. P. O'Byrne, which advised that of 120 asbestos workers sent for their regulatory examination, ten had shown abnormal physical signs in their chest X-rays. The X-rays and those of an additional 17 men were sent for opinion to Dr Geoffrey Sheers, Consultant Chest Physician at Plymouth General Hospital. Abnormalities of varying degrees were recorded in 17 of the 27 X-rays, suggesting some asbestos damage may be present.

O'Byrne also brought to attention research that had been conducted prior to 1965 and which revealed the risk of mesothelioma for individuals not working directly with asbestos but in the vicinity of operations involving the use of the substance, i.e. neighbourhood workers. This research included Wagner *et al*'s 1960 article and four different studies from 1964 plus one from 1965. O'Byrne concluded:

... detailed and thorough investigations carried out mainly within the past two years, by various authorities ... suggests that there is in fact very strong evidence that exposure to asbestos may produce a highly malignant, rapid and fatal growth in the pleura or lining of the lung. A further disquieting feature of these reports suggests that such a growth may occur even after a transient and trivial exposure to asbestos dust, and thus affect men who are in fact not officially classified as asbestos workers. There is strong evidence to suggest that the deaths within the past six months of two men employed in this Dockyard were due to this cause.⁴⁷⁵

⁴⁷⁴ N. Tait *Asbestos Kills* (Silbury Fund, 1976).

⁴⁷⁵ TNA, ADM 329/8

Noting that Sheers had termed this ‘a newly recognised and more sinister hazard associated with the use of asbestos’ and had called for the precautions in place at the time to be re-appraised, O’Byrne suggested that an investigation into all aspects of asbestos usage should be conducted.⁴⁷⁶

On 24 August 1965 the Medical Director-General (MDG(N)) wrote to AS Devonport noting that an informal discussion had taken place with Dr T A Lloyd-Davies, HM Senior Medical Inspector of Factories, who agreed that a medical investigation should be carried out.⁴⁷⁷ Lloyd-Davies had visited Devonport Dockyard on 23 September 1965 to look at the methods of working with asbestos. He held a preliminary and exploratory discussion to define the medical problem and the ways and means of initiating research. He saw asbestos being handled in the MED Mattress Shop, the application of lagging in HMS *Verulam* and the stripping of lagging in HMS *Bulwark*. It was noted by those accompanying him that ‘none who witnessed these dusty operations was in any doubt as to the very real nature of the health hazard to those exposed’.⁴⁷⁸

On 25 October 1965, Harries met with Lloyd-Davies, Dr J C Gilson, Director Pneumoconiosis Research Unit (PRU); Dr J E Cotes, PRU; and Dr J C Wagner, PRU (who was responsible for the 1960 South African study). Harries sent a report of the meeting to Surgeon Captain James, Devonport the following day, which recorded the severity of the issue and the urgent need for research. It was agreed that Devonport presented a suitable working group for the type of research required and that the data obtained would contribute to the knowledge of the harmful effects of asbestos.⁴⁷⁹ Fieldwork for the study was to be undertaken by Harries under the guidance of the PRU and would involve the 190 or so “Asbestos Workers” at Devonport plus two control groups: one with known periodic exposure to asbestos and the other without exposure. The groups would undergo a mixture of clinical tests and completion of questionnaires to assess the following:

1. Standard Health and Occupational History
2. Standard Clinical examination

⁴⁷⁶ ADM 329/8 *Use of Asbestos in HM Dockyard Devonport 1965*, letter forwarded by AS Devonport to Second Under Secretary of State (RN) on 12 July 1965, re Use of asbestos in HM Dockyard Devonport.

⁴⁷⁷ ADM 329/8 letter, 24 August 1965, from Medical Director-General to Admiral Superintendent Devonport

⁴⁷⁸ ADM 329/8

⁴⁷⁹ ADM 329/8

3. Lung Physiology
4. Sputum examination by standard technique for Asbestos bodies
5. Chest X-ray examination

A retrospective study of asbestos workers was also to be undertaken, as well as a possible study of other Dockyard employees with regard to the incidence of pleural and peritoneal mesothelioma, lung cancer and other carcinomata. It was noted that the depth of the study would be dependent on the completeness of records, but it was hoped that a 20-year period could be covered. Staff (one technician and two clerks) and equipment (to the value of £1,698) were also requested.

In a letter dated 13 December 1965, the Medical Director of the Navy, Surgeon Vice Admiral Sir Derek Steele-Perkins, shared with the then Secretary to the MRC, Sir Harold Himsworth⁴⁸⁰, the results of some of Sheers' X-rays of Devonport workers. These X-rays showed unexplained areas of thickening in the pleura of the workers' lungs, which may have indicated mesothelioma. He went on to state:

Asbestos is widely used in HM Dockyards and in view of the modern belief that a lesser and more casual exposure to its dust may ultimately lead to mesotheliomatous tumours, it is probable that both Naval personnel and a larger proportion of Dockyard employees than was previously thought to be the case are now exposed to risk.⁴⁸¹

The point of Steele-Perkins' letter was to gain financial support for the equipment and staff required for the study; his endeavour was successful.

Meanwhile, on 11 November 1965, Byrne's *Sunday Times* article was circulated to senior naval personnel including the Admirals Superintendent (AS) of all of the home Dockyards, with a covering note titled *Precautions When Using Asbestos*.⁴⁸² A similar letter was sent out to the overseas Dockyards, but not until January 1966.⁴⁸³ No explanation was given for this delay.

⁴⁸⁰ Sir Harold Percival Himsworth, KCB, was Secretary to the Medical Research Council 1949-1968.

⁴⁸¹ ADM 329/8

⁴⁸² ADM 329/8

⁴⁸³ ADM 329/8 T Cullen [CMB/CCB Por] wrote to AS Gibraltar on 10/1/1966 advising of the study and highlighting the need for precautions to be strictly applied and supervised; similar letters were sent to the Commodore Superintendents at Singapore and Malta on the same day.

On 1 December 1965, G E Bryant, Secretary, Official Side, Navy Department Industrial Whitley Council wrote to J E Heritage, Secretary to the Trade Union Side regarding the press coverage of asbestos and its dangers. He advised Heritage of the study being planned at Devonport, briefly outlining what it would entail and stating that it would be conducted within the Dockyard and within working hours. He committed to keeping local Whitley Committees and the workers involved informed and requested Heritage's co-operation.⁴⁸⁴ As can be seen from Bryant's letter, the Navy consulted the Trade Union Side voluntarily when matters that would impact on the workforce arose. The importance of co-operation with the workforce, given its required involvement in the study, is in this case obvious. The Devonport study commenced in 1966 and the results were published in the *British Medical Journal* in 1968, including four X-rays showing lung abnormalities: pleural plaques, pleural and pulmonary fibrosis (asbestosis) and pleural thickening.⁴⁸⁵ They classified trades into exposure groups (see table 5.3). The results of the study in terms of lung abnormalities found among workers in the sample were varied. Asbestosis was found in four cases including one labourer who had worked at the Dockyard for 29 years and had in the course of his work cleared up lagging debris in an aircraft carrier. It was noted that 'Exceptionally high dust counts have been recorded during this procedure'.⁴⁸⁶ Some 11 cases of extensive pleural thickening were found; seven in groups 2 and 3 and two from group 4. One of the two from the latter group was a cleaner in the boilermakers' shop who had also been involved in cleaning up lagging debris and the other had been a naval engine-room rating for 22 years before joining the Dockyard to work with small craft. Pleural plaques cases were found in 48 workers: ten in group 1, 27 in groups 2 and 3 and 11 in group 4. Calcification was observed in seven cases, one of which, seen in an electrical fitter who had worked ashore on telephone exchanges for 12 years, had unexplained exposure. There were 63 cases of lung abnormality attributable to asbestos exposure in the sample of 1,414 men, which Sheers and Templeton predicted would mean that 600 cases could be expected in the workforce as a whole. Although the prevalence of abnormalities was among high risk group 1, they also occurred among those with intermittent and low exposure to asbestos.

⁴⁸⁴ ADM 329/8

⁴⁸⁵G. Sheers and A.R. Templeton 'Effects of Asbestos in Dockyard Workers' *British Medical Journal* 3 (1968), pp574-579.

⁴⁸⁶Sheers and Templeton 'Effects of Asbestos in Dockyard Workers', p576.

Sheers and Templeton included a short section on malignant diseases, which included mesothelioma and lung cancer. The first histologically confirmed case of mesothelioma in Devonport Dockyard occurred in a man who had worked there as a boilermaker for 31 years. Subsequently, three cases were confirmed in 1965, two in 1966 and five in 1967. All occurred in workers who had intermittent exposure to asbestos and 30 years or more had passed since exposure in all but one case.⁴⁸⁷ According to Harries, workers at Devonport Dockyard from a number of trades, who were not recognised asbestos workers, were found by the Pneumoconiosis Panel to be suffering from asbestosis in circa 1967. All of these trades, with the exception of the joiner and shot blaster, worked in ships' machinery spaces, boiler rooms and engine rooms among other areas. The joiner cut, fit and tore down acoustic insulation, while the shot blaster would have cleaned and blasted asbestos coated pipes. The occupations of Devonport Dockyard workers suffering from pleural mesothelioma at the same time did not include any recognised asbestos workers, but did include the trades of boilermaker, fitter, labourer on ships, shipwright and welder.⁴⁸⁸ In a letter to Dr Knox (T&N) in 1967, regarding a preview of a paper he was planning to present to the British Occupational Hygiene Society, Harries informed that 49 Devonport workers had been diagnosed by the PRU with asbestosis and 10 had mesothelioma.⁴⁸⁹

The study was extended to the Dockyards at Chatham (October 1972), Portsmouth and Rosyth and a report was published in December 1975.⁴⁹⁰ Table 5.4 shows the survey population and response rates for Chatham Dockyard. Of the non-responders, five were medically discharged; one because of lung cancer and four because of respiratory diseases. Deaths among non-responders included two cases of lung cancer and one case of mesothelioma.⁴⁹¹ The response rates were lower at Chatham than those at Devonport, but higher than those at Portsmouth and Rosyth.

⁴⁸⁷Sheers and Templeton 'Effects of Asbestos in Dockyard Workers', p578.

⁴⁸⁸Harries 'Asbestos Hazards in Naval Dockyards', p138.

⁴⁸⁹ Electronic copy of letter from Peter Harries to Dr Knox, Turner & Newall Asbestos Limited, 6 September 1967. Kindly provided by Professor Geoffrey Tweedale, Manchester Metropolitan University.

⁴⁹⁰ P.G. Harries, C.E. Rossiter and R.M. Coles *Royal Naval Dockyards Asbestosis Research Project: Report No 1 December 1975: Main Morbidity Study of the Total Population at Devonport, Chatham, Portsmouth and Rosyth Dockyards* (Gosport: Institute of Naval Medicine, 1975).

⁴⁹¹ Harries *et al* *Royal Naval Dockyards Asbestosis Research Project*, pp42 & 43.

Radiographic abnormalities were recorded in terms of age, occupational category (which mirrored the exposure groups identified by Sheers and Templeton), duration of employment, duration of exposure and smoking habits (see tables 5.5 to 5.8). Various comparisons were included and from the research Harries *et al* were able to conclude that workers at Devonport and Portsmouth were most affected, due to the larger number of major refits of large vessels at those Dockyards. The study provided further confirmation that those who worked near asbestos work or in engine/boiler rooms had greater exposure to asbestos. Smoking was found to increase the prevalence of pleural thickening and asbestosis.

While it was certainly true for some workers that they were exposed for the entirety of their employment, many moved between roles. Once a worker had been employed on asbestos spraying or other registered asbestos work, they underwent periodical medical examinations even if they moved on to jobs that did not expose them to asbestos. Some workers moved into management roles, such as Recording and Measuring, which took them away from industrial work. As will be seen later in this chapter, this could mean further exposure if they were expected to measure asbestos work, but typically it would represent a reduction in exposure. Harries *et al* noted this movement of workers in their study, explaining that some of the workers appearing under occupation category 4 (all other Dockyard occupations) and who suffered from ARD, were there because of promotion from or transfer out of one of the other categories.⁴⁹²

Harries *et al* found that prevalence for pleural thickening was higher than average in: ladders ashore; asbestos storemen; and the following trades when working afloat: welders; boilermakers; painters; plumbers; joiners; burners; riveters; caulkers; drillers and other men working with asbestos. The table for Chatham showed that pleural thickening occurred in all four occupational categories, but the prevalence was highest amongst workers in category 1. Workers in categories 3 and 4 were least likely to be affected. The difference between the rates for each category at 6.7%, 4.3%, 3% and 2.9% were much less marked than for pulmonary fibrosis.

Pulmonary fibrosis is a condition in which the lung tissue becomes scarred and thicker and the lungs lose their ability to transfer oxygen to the bloodstream. If the cause of the disease is unknown, then it is called idiopathic pulmonary fibrosis or cryptogenic

⁴⁹² Harries *et al* *Royal Naval Dockyards Asbestosis Research Project*, p15.

fibrosing alveolitis. Where a sufferer has known exposure to asbestos, this warrants the diagnosis of asbestosis. Rates of pulmonary fibrosis in the Dockyard study were highest in ladders afloat and ashore; sprayers; sailmaker ladders; and the following trades when working afloat: masons; painters; burners; caulkers; drillers and in other men working with asbestos. In Chatham prevalence among category 1 workers was 6.9% compared with less than 1% for each of the other categories.

Pleural calcification when associated with asbestos exposure can be assumed to be pleural plaques. It should be noted, however, that it can also be caused by other factors including previous lung infections. In the Dockyard study as a whole, pleural calcification was most common in ladders ashore and the following trades when afloat: masons; welders; electrical fitters; painters; plumbers; burners; riveters; caulkers; drillers and other men working with asbestos. Chatham recorded the highest prevalence in category 1 at 4.3%. The rates for the other categories were close at 1.5%, 1% and 0.8%. Tables 5.5 to 5.6 show the prevalence of radiographic abnormalities in Chatham workers by duration of employment and by duration of exposure.

The study also recorded the smoking habits and ages of Chatham Dockyard employees and the impact that smoking had in terms of lung health and other symptoms. Irving Selikoff *et al* suggested in their research published in 1970 that asbestos workers who smoke were 90 times more likely to develop asbestos-related cancer.⁴⁹³

Harries' extended study concluded that:

1. the radiological abnormalities recorded showed that a large number of Dockyard employees were affected; that their exposure was intermittent and that the occupations most at risk were those working afloat during refit periods 'when widespread dispersal of asbestos dust was common'. The bulk of this work was carried out at Devonport and Portsmouth;
2. smoking played a larger part in the prevalence of some radiological changes. Pleural thickening was more common in smokers than in non-smokers, although exposure to asbestos played a slightly larger part in occurrence of this abnormality. No relationship seemed to exist between smoking and pleural calcification;

⁴⁹³ Harries *et al* *Royal Naval Dockyards Asbestosis Research Project*, p2.

3. clear relationships existed between asbestos and respiratory illnesses/symptoms for both smokers and non-smokers;
4. duration of exposure and of employment were closely linked to the presence of abnormalities;
5. the improvement in working conditions for all processes involving asbestos which have been introduced into the dockyards by the Ministry of Defence (Navy) from 1966 onwards have resulted in the virtual elimination of exposure to asbestos dust. Because of this, new entrants to the industry should not now be at risk from asbestos related diseases.⁴⁹⁴

It should be noted that, while Harries was very intent on minimising the asbestos hazard to Dockyard workers, he was not against the use of certain asbestos products. If internal correspondence within the T&N archive (T&NA) is to be believed, Harries was convinced as late as 1972 that asbestos products could be safely used and seemed to be in support of dust-suppressed products then under development by T&N.⁴⁹⁵ Indeed, Harries agreed to test T&N's Fortex Cloth on HMS *Tenby* in 1971.⁴⁹⁶ Some workers also voiced a preference for asbestos cloth, particularly Dockyard ladders who found glass cloth a challenging material to work with. It was more difficult to fit than asbestos and was irritating to the skin.⁴⁹⁷ Ladders in Devonport revealed that they had been tearing asbestos cloth rather than cutting it and that while this gave rise to more dust it meant they could complete their work more quickly and therefore earn more; glass cloth could not be torn and the ladders were unimpressed by this fact.⁴⁹⁸

A Chargeman of Ladders from Chatham Dockyard told T&N's Mr S. Freshwater in February 1971 that three Ladders had died from asbestosis in the previous year; that six further cases had been confirmed and 60 were suspected.⁴⁹⁹ A record of claims for

⁴⁹⁴ Harries *et al* *Royal Naval Dockyards Asbestosis Research Project*, p29.

⁴⁹⁵ T&NA, internal memorandum from E. A. Edmonds to Dr S. Holmes, Health Physics, Rochdale, 4 February 1972.

⁴⁹⁶ T&NA, internal memorandum from Edmonds to Holmes, 15 January 1971.

⁴⁹⁷ T&NA, internal memo from Edmonds to Mann, 7 December 1965, p1.

⁴⁹⁸ T&NA, confidential internal memorandum from Edmonds to Mann, 24 June 1966, p3.

⁴⁹⁹ T&NA, copy of internal memo from Mr S Freshwater, London Office to Mr E. B. Gates, 15 February 1971.

damages between 1969 and the first half of 1971 would seem to confirm this. Of the 113 claims for damages for asbestosis paid by the Admiralty, two were from Chatham Dockyard, four from Portsmouth Dockyard and 107 from Devonport Dockyard. Table 5.2 shows how the claims were distributed among trades. More comprehensive protection for workers had been in place in the Dockyards since 1967. These claimants would, however, typically have been exposed to fibres between the mid to late 1940s and 1956. Sprayed Limpet Asbestos (SLA) workers account for just two of the claims. While painters and ladders may have been recognised asbestos workers, it is probable that the majority of the trades listed were not and were therefore afforded very little protection.

The MoD confirmed that 393 personal injury claims have been brought against it by former Chatham Dockyard workers for ARDs since May 2002. Considering the latency periods, exposure for those claiming may have been at any time between 1942 and the Dockyard's closure in 1984. The peak of use of the mineral in naval shipbuilding and ship-repairing was during the Second World War and the 1950s. As mentioned, asbestos began to be withdrawn from naval specifications from circa 1965 and protective measures were redoubled thereafter. With this in mind it can be assumed that the highest levels of exposure would have occurred between 1945 and 1965, though it is acknowledged that exposure did still occur beyond this date. While the number of claims cannot be considered an accurate measure of the number of workers affected by asbestos exposure, it does give an idea of how serious the risk was for Dockyard employees. It also indicates the litigation risk for the MoD.

A database of 56 cases of ARD among former Chatham Dockyard workers was compiled for this study from various sources.⁵⁰⁰ Of these 54 men and two women, 43 are known to have been neighbourhood workers and two would have come under category 4, though, like those in Harries' work, for much of their careers they were also neighbourhood workers. For seven of the workers, their trade is currently unknown and so it is impossible to state which category they would have fallen under. There were 30 cases of mesothelioma and all but one of these individuals are now sadly deceased. Of the 11 individuals who had asbestosis; six are known to be deceased. Eight had pleural plaques and none are known to have died from the condition. This supports the current medical and

⁵⁰⁰ Sources included official MoD records, newspaper reports, court reports, coroner's inquest reports, questionnaire responses and legal firms' websites.

legal position that the condition is not life-threatening. Two cases of asbestos-related lung cancer were recorded. Two individuals were recorded under 'other ARD'. In one case the individual had pleural thickening and interstitial fibrosis (also known as pulmonary fibrosis), while for the other individual the actual ARD that they died from was not specified. A number of the cases were recorded from death certificates held at Devonport Dockyard.⁵⁰¹ Only cases where asbestos-related disease was specifically recorded were included in the database, but it was noted during the research that heart attacks, chest/lung disorders and cancers were recorded as the cause of death for many former Chatham Dockyard workers. Given more time it would have been interesting to investigate the careers of the individuals who died and other factors, such as whether they were smokers, to establish whether undiagnosed asbestosis could have been the underlying cause of death. All were industrial workers (with the exception of Mavis Nye), which suggests that Harries' decision to exclude office workers from his study was sound. The one female shipwright affected was among those women who took over Dockyard work during the Second World War and who left at its end or shortly thereafter. The relative absence of female cases of ARDs in this study can be attributed to several factors. Firstly, since women only latterly began to take on industrial roles, including ship cleaning, it is possible that, while some may have been exposed to asbestos and sustained lung damage, symptoms of subsequent conditions are yet to present themselves. Also, even at the time of the Dockyard's closure, women remained in the minority in industrial positions and hence the probability of cases among these women must be lower. For those who had worked in the Dockyard during the Second World War, it is possible that any symptoms of lung disorders were attributed to other factors by doctors, such as smoking, particularly if the women concerned did not recognise that they had worked near asbestos debris. Likewise with ARDs contracted by the wives and/or children of Dockyard workers, which could have been misdiagnosed or attributed to the many other sources of asbestos that these individuals were exposed to in their lives, while ironing or driving, for example. Testimony, from some of the cases identified, is included below.

Brian Dees was a paint sprayer at Chatham Dockyard between 1949 and 1964, with a short break from 1954 to 1957 for National Service. Dees' exposure to asbestos was

⁵⁰¹ From the MoD Devonport Civilian Occupational Health Record Archive.

predominantly from dust and debris in the environment where he worked; from this he contracted mesothelioma. In a statement taken before he died on 29 April 2011, Dees told his lawyers that he had been an active man, having last worked in 2010 and that he had restored motorbikes as a hobby. After developing flu-like symptoms and a persistent cough, medical examination found he had mesothelioma in January 2011. Dees said that it was clear from the medical prognosis he had been given that he would not need to write Christmas cards in 2011.⁵⁰² Commenting on his working environment, Dees described piles of debris and rubble in the Dockyard that included asbestos piping, with the wind blowing asbestos dust around. Mealtimes were had afloat to minimise stoppage time and any dust and debris was cleared quickly with a broom before workers sat down to eat, potentially releasing settled asbestos fibres into the air. He, like many other Dockyard workers, had worked in engine rooms and boiler rooms, which he described as like working in a snow storm because of the asbestos dust in the air. He had joined a night shift gang at one point because the money was good, which involved working with ladders. He recalled using an airline to clear dust and debris, including asbestos, from areas before they could be painted, again this could have released asbestos dust into the air. Dees listed the protective equipment he was given: overalls, muslin cloths for the face and neck and grease to make it easier to remove the paint from his skin after his shift, none of which would have protected him from asbestos fibres.⁵⁰³

Raymond and Mavis Nye, a married couple, both have ARDs. Raymond has pleural plaques caused by exposure from working afloat as a shipwright at Chatham Dockyard between 1955 and 1962. His wife has mesothelioma; her exposure is believed to be from washing the clothes that Raymond wore underneath his work overalls. Raymond recalls working on the following ships in the Dockyard: HMS *Artemis*; HMS *Alaric*; HMS *Seraph*; HMS *Turpin*; HMS *Tiptoe*; HMS *Swiftsure*; HMS *Cassandra*; HMS *Diamond* and HMS *Tenby*. The Chatham Dockyard Lock Logs confirm that these ships were in the Dockyard during the period that Raymond worked there.⁵⁰⁴ Mavis was diagnosed with mesothelioma in 2009, after going to hospital with twisted limbs, numb feet and difficulty breathing. Her exposure could have been at any time between 1949 and 1994. Mavis'

⁵⁰² Coroner's Inquest Hearing, County Hall, Maidstone, 12/5/2011: Brian Thomas Dees. Coroner: Patricia Harding.

⁵⁰³ Coroner's Inquest Hearing, County Hall, Maidstone, 12/5/2011: Brian Thomas Dees

⁵⁰⁴ Royal Dockyard Library (RDL), Chatham Dockyard Lock Log No 36

father also worked at Chatham Dockyard and she recalls him returning home covered in dust:

[Asbestos] in its dust form was brought home on his clothes and in his hair, which was distributed when washing his clothes and in contact with us as children when he played with us. Unknown to him at that time he was carrying home a time bomb that would help to kill him, and maybe his contribution, in later life, me also.⁵⁰⁵

Though he refused to see a doctor and his death certificate recorded a heart attack, Mavis recalls that her father had extreme difficulty breathing towards the end of his life, 'so much so that he was no longer able to walk up his garden to tend to his beloved allotment'. She also remembered that his legs had become thick and black.⁵⁰⁶ It is her belief that her father suffered from ARD.

Shortly after Mavis' diagnosis and while she was still in hospital, Raymond wrote down his own feelings on learning that his wife had a terminal disease caused by asbestos:

Worst thing is. I must put this down to me. I have helped to kill the most precious thing in my life. How can I cope with that? The poison dust was on my clothes in my hair, asbestos. A job that I took to earn money for wife and family. Now with one child gone [the couple lost a daughter in a car accident in 1978] and maybe soon a wife. I don't want to go on. Life can be cruel. Terry [their son] has his life he will get over Mavis, it's something kids have to do and me. But to loose a wife or husband is not the same.⁵⁰⁷

At the time of writing this chapter, Mavis was battling the disease through a medical trial and in January 2013 had just received the results of her latest scan, which was clear.

Ernest Watson was exposed to asbestos while working as a Welder between 1958 and 1969. He recalled working on the refits of HMS *Loch Fada*, HMS *Lynx* and HMS *Chichester* and that while working in the boiler and engine rooms, asbestos ladders were carrying out lagging work nearby. The Lock Logs confirm that these frigates were in the Dockyard during the period, with HMS *Lynx* and HMS *Chichester* each undergoing extended refits to install a combined mast and stack (mack) in 1963 and in 1964

⁵⁰⁵M. Nye *Meso Warrior: One Woman's Fight Against Mesothelioma* (UK: Trotting Dog Media, 2010), p8.

⁵⁰⁶ Nye *Meso Warrior*, p8.

⁵⁰⁷ Nye *Meso Warrior*, p23.

respectively.⁵⁰⁸ Watson 'confirmed that the dust was extreme and there was no way for it to escape from the boiler rooms or engine rooms and that it was impossible not to breathe the asbestos dust in. Ernest described how his hair would be thick with asbestos dust at the end of each day'.⁵⁰⁹

Another welder, Derek Borrill, was employed at Chatham Dockyard between 1960 and 1969. Borrill died in 2004 from a chest infection and asbestosis. The report of the court case for damages on behalf of his children included the following statement:

He also worked alongside and in close proximity to ladders, who stripped off and removed old asbestos lagging to be replaced with new asbestos plaster. Ladders poured large sacks of asbestos powder into tubs mixed with water and applied the wet mix to pipe work and boilers. He removed asbestos lagging from pipeworks with a chipping hammer and used asbestos blankets draped over machinery where he was working to provide protection from molten metal.⁵¹⁰

The Evening Post ran an article about Frank Pitt, a shipwright driller who died from mesothelioma after exposure at Chatham Dockyard. He was not a registered asbestos worker but drilled bulkheads that were insulated with the material. Pitt also watched his friend and colleague die from mesothelioma and asbestosis in 1979. Pitt's widow recalled:

I remember one of his friends Tom Knight was dying from cancer caused by the dust and Frank used to visit him. He saw him die from the disease and he came home upset and said he hoped nothing like that ever happened to him.⁵¹¹

Mr Phillips was awarded compensation totalling £40,000 by the Ministry of Defence for pain, suffering and loss of amenity due to pleural thickening and interstitial fibrosis. He was exposed to asbestos during his work as a boilermaker at Chatham Dockyard between 1956 and 1973. The court report records that Phillips' social and domestic activities were curtailed and that he was no longer able to swim or play football.⁵¹²

⁵⁰⁸ RDL, Chatham Dockyard Lock Log No 36 ; R. Blackman (Ed) *Jane's Fighting Ships 1968-69* (Sampson Low, Marston & Co Ltd).

⁵⁰⁹ Thomson Snell & Passmore (Watson's lawyer) website: www.ts-p.co.uk

⁵¹⁰ BAILII *Pacey v Ministry of Defence* 19/3/2009.

⁵¹¹ 'Cancer fears that haunted Yard man' *The Evening Post*, 18 October 1990, p6.

⁵¹² Westlaw UK online database: *Phillips v Ministry of Defence*.

Brian Jenkins was diagnosed with pleural plaques in 2005, after responding to a newspaper advert. Personal injury lawyers arranged chest scans at the Bridgewood Manor Hotel, Gillingham and assisted those diagnosed with pleural plaques (and presumably other ARDs) to claim from the MoD. When he arrived at the hotel, Jenkins recognised several of his former colleagues from Chatham Dockyard, also there for chest scans. Jenkins' exposure to asbestos started as an apprentice, with asbestos packing in components and breaking asbestos around components to practice dealing with valves and continued afloat when he qualified. Jenkins' case did not go to court, but the MoD paid him a four figure sum in damages.⁵¹³ The following comments highlight how even this non-debilitating condition can impact sufferers' lives:

Pleural plaques are scars on the lung, I have about 1% - 3% which are always there, and although at such a small % you can't feel it at all, it makes you very conscious of what conditions your in. ie. although the law states people [aren't] allowed to smoke in enclosed public places they do in their own homes. Smoking aggravates and could worsen Pleural Plaques So when two weeks ago I visited somebody and he lite up indoors in my presents, although I was only there 30 mins or so, my thoughts was constantly about his smoking ... Although my % chance of it getting worse is very small it can happen and even at 1% - 3 % damage it will take three months of my living age.⁵¹⁴

Though he is conscious that the scarring is there, the condition has not stopped Jenkins from doing things. His interests have included archery, cross-country running and dancing, for which he has won medals. Jenkins' experience supports the theory that pleural plaques are not debilitating.

The experiences of victims of ARD who worked at Chatham Dockyard echo those recorded by Johnston and McIvor. For example, some reflected on the impact of ARD on their social lives. One ships' plumber stated 'See my wife and I were great dancers. We used to love going to the dancing. Now if I dae one turn round the hall I'm buggered'.⁵¹⁵ Another of their interviewees commented:

⁵¹³ Informal interview with Brian Jenkins at Chatham Dockyard Historical Society on 14 April 2011.

⁵¹⁴ Email correspondence with Brian Jenkins 11 March 2011.

⁵¹⁵ Johnston and McIvor 'Dust to Dust', p59.

I was no bad dancer. I liked dancing and that. But you cannot dae that now because you're breathless ... Even getting out of bed in the morning you're breathless. Even washing and that ... Walking down and getting the papers you're breathless.⁵¹⁶

A former marine engineer from Grangemouth was fortunate to receive a pay-out for pleural plaques before the law changed. Apart from being more susceptible to colds and chest infections, the condition has not adversely affected his life:

I still feel a fraud. I've got it, I mean there's no doubt about it. Eh, one of the consultants explained it as like, if I opened my, if my lungs were opened out like that, it's as if somebody had got a lighted candle and went like that down it, and its like candle grease.⁵¹⁷

Exposure dates were difficult to analyse, particularly as dates for 14 of the individuals were unknown. From the remaining cases recorded the following was surmised. (It must be noted that actual point of exposure is impossible to determine and as a result the exposure dates recorded are generally either the dates between which workers undertook work with or near asbestos or, most commonly, the dates worked at Chatham Dockyard.) Asbestos was present in ships refitting and repairing at the Dockyard until it closed in 1984. Any worker could, therefore, have been exposed until that point. Protective measures were introduced for all workers from 1967, so it can be assumed that the danger of exposure decreased from that time. Certainly, 11 of the 56 workers left the Dockyard's employ before 1967 (note in the case of Mavis Nye, her husband's employment dates have been used to determine her exposure). For 26 individuals the case is less clear – they worked at the Dockyard before and after 1967, some right up until closure and some for just a year or two. The assumption could be made that the majority of these individuals were exposed to asbestos before the Admiralty measures were put in place. Three individuals, however, worked at Chatham Dockyard solely after 1967.

The first two, a logger and a labourer, entered Chatham Dockyard too late for the exposure that caused their ARDs to have been there. Very little information was obtained about either of them and it is possible that they were among the great number of hired workers who moved between employers or Dockyards. The possibility that they worked at Chatham Dockyard or another Royal Dockyard previously must also be noted. It is also

⁵¹⁶ Johnston and McIvor 'Dust to Dust', p59.

⁵¹⁷ Johnston and McIvor *Lethal Work*, p189-90.

possible that they worked solely in the private sector before they were employed by Chatham Dockyard. Without further detailed research in either case it is impossible to know.

The third case concerns Barry Newman, who died from mesothelioma. Newman was a boilermaker between 1967 and 1983. He was about 15 years old on entry and successfully completed an apprenticeship. Between 1977 and 1981 he was registered as a radiation worker and so would have worked for at least some of that period in the Nuclear Complex.⁵¹⁸ Because of this he underwent annual medical checks, though these would have been designed to pick up exposure to radiation rather than asbestos. Cleanliness was of paramount importance in the Nuclear Complex and asbestos dust and debris would not have been allowed to accumulate in case it contaminated the reactor. As is shown in Chapter 6, workers were even provided with white overalls to encourage cleanliness. It is, therefore, unlikely (though not impossible) that Newman's exposure was during his employment on nuclear submarine work. Newman successfully claimed against the MoD for mesothelioma contracted during his employment and as was common at this time the case was settled out of court. A newspaper interview with Newman while he was still alive gave the impression that he did not receive any warning about the risks or any protective equipment at all during his employment.⁵¹⁹

Exposure from a previous employer can be ruled out in Newman's case, but he was about 31 years old when he left the Dockyard's employ and so presumably found work elsewhere. Exposure during subsequent employment is, therefore, possible. Observing that the diagnosis was circa 2006/7, the exposure that caused his mesothelioma could potentially have been at any time from his birth until the early 1990s. It is not known whether any members of Newman's family worked at the Dockyard before him and could have brought the offending fibres into the home. If his exposure was at Chatham Dockyard and his claim to have been ignorant of the hazard is true, Newman's case challenges Harries' claim that the Dockyards were free of the asbestos risk after 1967. Understanding whether this case is unusual or whether other workers remained ignorant despite the MoD's measures, would help to establish how effective those measures actually were. Like those

⁵¹⁸ From the MoD Devonport Civilian Occupational Health Record Archive.

⁵¹⁹ *Medway Messenger* 20/4/2007, p4.

of many Chatham Dockyard workers, Newman's personnel record is untraceable, but his occupational health file is still extant. A search of the file was conducted by the Devonport Occupational Health Record Archive, but found no evidence of Newman's involvement in Harries' study nor asbestos medical checks that would have been consistent with work as a registered asbestos worker. Evidence of these things would have indicated that some level of information about the asbestos risks would have been passed on to Newman. Their absence is not, however, enough to suggest that Newman was completely ignorant of the risks. The date of death is not available and so it would be costly to obtain a coroner's report that may shed some light on Newman's exposure. Without any final conclusion in relation to this case, it has to be acknowledged that there is a possibility that some workers were not protected against asbestos after 1967. Testimony from electrical fitter Linda Read, who started her apprenticeship in 1973, would seem to support this:

“Electrical breakers on submarines have these asbestos pads and I had to file them and shape them and because I commented about it, you know, I wasn't too happy about doing it ... I got a bad report remark from that.” Were you provided with a mask? “No nothing whatsoever, and I used my own file tool from my own toolkit to file it so the dust was carried into my toolbox.”⁵²⁰

Read's comments show that she was aware that asbestos was dangerous. Whether the person managing her at the time lacked knowledge or was simply negligent is unclear.

***Death Peril in Overalls*⁵²¹: awareness among Dockyard workers**

... there are some people in the Dockyard whose emotions are very high and take heed of many a garbled story. In case you do not know it, there never was such a place as a Dockyard for rumour on almost every conceivable subject.

Edward A. Edmonds, T&N Director, London⁵²²

As mentioned in the introduction to this chapter, 1965 has been identified as the turning point in the Admiralty's management of the asbestos hazard. This also represents the beginning of widespread public comprehension of the risks. This period saw the beginning

⁵²⁰ Interview with Linda Read.

⁵²¹ Title of article on the health hazards of asbestos printed in *The Daily Mirror* 1 November 1965. This article followed the watershed article in *The Sunday Times* on 31 October 1965.

⁵²² T&NA, internal letter from Edmonds, London Office to Holmes, 5 November 1970.

of a general increase in media and public interest in health, safety and environmental issues, such as thalidomide, atomic energy, lung cancer from smoking and the 'deleterious effect of toxic chemicals on the 'natural environment' and human health'.⁵²³ In the late 1960s, the health impacts of industrial chemicals, like vinyl chloride, highlighted public suspicion of industry.⁵²⁴ In sociological debates, dissent and mistrust of scientific and expert information has been discussed in the context of modernity. For example, Wynne identifies problems in the expert-lay public relationship, arguing that dependency on the expert body or the organisation that employed promotes silent ambivalence and mistrust among lay-publics.⁵²⁵ This becomes particularly apparent where advice or instructions change as a result of, for example, initial misapprehension of the risk or rejection of local lay knowledge. Wynne illustrates this with a case study of Cumbrian sheep farmers, which is referred to in chapter 6 of this thesis.⁵²⁶

There is evidence in contemporary documents that Dockyard workers became more aware of asbestos hazards. Certainly, by December 1965, T&N began to worry about increasing awareness among Dockyard workers. Edmonds reported that news of the death of a Devonport Dockyard lagger from asbestosis had reached Chatham Dockyard.⁵²⁷ He was concerned to learn that some Chatham Dockyard engineers had taken their protection into their own hands by vacating an engine room while laggings cut calcium silicate. He was further concerned that the MoD had issued instructions to union representatives concerning people handling asbestos. According to T&N's informant at Chatham Dockyard, small vacuum cleaners were issued to the lagging shops and lagging inspectors were provided with lamps to check the dust content in the air. Whether these measures were really introduced and whether they were as rudimentary as they seem, is unclear. What is evident,

⁵²³ Sirrs *Health & Safety in the Age of Risk*, p55.

⁵²⁴ E. Leopold *Under the Radar: Cancer and the Cold War* (London: Rutgers University Press, 2009), p164.

⁵²⁵ B. Wynne 'May the Sheep Safely Graze/? A Reflexive View of the Expert-Lay Knowledge Divide' in S. Lash, B. Szerszynski and B. Wynne (eds) *Risk, Environment & Modernity: Towards a New Ecology* (London: Sage Publications Ltd, 1996), p44-83.

⁵²⁶ Wynne 'May the Sheep Safely Graze?'. p62-7. For the problems of communicating risk information and of the public perception of risk see: C. Needleman 'Ritualism in Communicating Risk Information' *Science, Technology & Human Values* 12:3/4; Wynne 'May the Sheep Safely Graze/?'; Irwin *Citizen Science*; D. Nelkin (ed) *The Language of Risk: Conflicting Perspectives on Occupational Health* (Beverly Hills, USA: Sage Publications Inc., 1985). For the contribution of occupational hygiene to the development of environmental health science, see C. Sellers *Hazards of the Job: From Industrial Disease to Environmental Health Science* (Chapel Hill, USA: North Carolina University Press, 1997).

⁵²⁷ T&NA, internal letter from Mr A.C. Mann, Rochdale to Edmonds, 17 December 1965, p1.

however, is that the workforce was beginning to understand the danger. Edmonds closes with a plea that the contents of his letter not be revealed to the MoD, 'as they would almost certainly know how we obtained [the information] and immediately exercise a close control over our sources of information'.⁵²⁸

In 1966, Devonport Dockyard ladders were reputedly using the publicity surrounding the asbestos hazard to clear their working areas of fitters and other workers.⁵²⁹ Ships and submarines became very crowded with different trades undertaking different tasks at the same time. This is evidenced by the number of neighbourhood workers contracting ARDs, but it was also a recurring comment when interviewing former workers for the study. If the asbestos risks *were* being used successfully by ladders to make their working area less crowded, this further illustrates how concern was beginning to spread among the workforce even before the MoD started to introduce protective measures for neighbourhood workers.

Another internal source from T&N mentions the refusal of workers in Devonport Dockyard's Submarine Welding section to use asbestos cloth during their work. The welders were concerned that seven of their number had contracted ARDs, including two with mesothelioma and one with lung cancer and that one with asbestosis had died. T&N believed that Empson was using the incident to justify a ban on asbestos cloth at Devonport Dockyard and that:

Mr Empson may be under some pressure from the Admiralty's legal section as there are some 50 writs at Common Law pending, alleging negligence by the Admiralty, by men suffering from asbestosis.⁵³⁰

The MoD managed to keep the claims, which were from Devonport workers, out of the public eye. This feat was allegedly achieved because of Harries' 'excellent relations with the local coroner'.⁵³¹

Edmonds' comments at the beginning of this section, come from an internal letter relating news of a further refusal by some welders at Devonport Dockyard to use asbestos

⁵²⁸ T&NA, internal letter from Mann to Edmonds, 17 December 1965, p2.

⁵²⁹ T&NA, internal T&N memorandum from Edmonds to Mann, 25 February 1966, p3.

⁵³⁰ T&NA, internal T&N visit report by Dr F C Lewinsohn regarding visit to Plymouth dated 27 November 1967, p1.

⁵³¹ Tweedale *Magic Mineral to Killer Dust*, p189.

cloth, this time in 1970. Particular mention is made of a new temporary foreman of the yard on the welding side, Mr F H Richards, whose ‘comments on the dangers of asbestos were quite frightening’.⁵³² Later in 1976 at Chatham Dockyard the use of air-fed hoods by workers removing fibreglass from the bulkheads of a vessel caused concern among neighbourhood workers that hazardous dust was present. The personnel manager was moved to issue a memorandum, which was placed on noticeboards and copied to safety representatives stating ‘Air-fed hoods are being worn not because there is a hazard but because the fibreglass is a nuisance and has irritating properties’.⁵³³

This evidence from contemporary sources shows that some workers were aware of the danger of asbestos. As will be shown later in this section, some of the questionnaire responses for this study also show a degree of awareness. At the same time there is testimony from others who have no recollection of training or protective measures.

Asbestos has left a legacy of fear and the threat is even remembered by many who escaped injury. When asked about the working conditions at Chatham Dockyard, industrial deafness and ARD were the industrial diseases most commonly mentioned by those involved in the study. Chris J Andrews, former electrical engineer, considered himself lucky to have escaped contamination from asbestos, but contemplates ‘how many old “mateys” simply had pneumonia on their death certificates when their passing should have been attributed to asbestosis’.⁵³⁴ Former joiner Keith Yeates recalled his first experience afloat as an apprentice in 1948:

We were ... put on a destroyer, which was one of the first ones to have the Olympic Asbestos. ... what used to happen is all the furniture was taken off the ship’s side and wire mesh, like chicken wire, was put over the ship’s side and fixed on and then the Painters, poor souls most of them dead by now I should think, sprayed Olympic Asbestos, which was like cornflake size pieces of flaky asbestos onto the bulkhead then the Painters would put a top coat on this to seal it in.⁵³⁵

In a group interview, former shipwright Dai Evans argued that ‘asbestos was a good example of what they [the MoD] didn’t do’. There was some disagreement among the

⁵³² T&NA, internal letter from Edmonds to Holmes 5 November 1970.

⁵³³ RDL Ref: 2011.0541 Personnel Manager’s Temporary Memorandum 39/76: Health and Safety: Use of Fibreglass.

⁵³⁴ C. J. Andrews *The Life and Times of a Dockyard Matey* (Published privately: Chris J Andrews, 2006), p58.

⁵³⁵ Group interview G2003/2, 1 December 2003, at Chatham Dockyard.

group as to how much the MoD should have known about the dangers of asbestos, but there was certainly an undercurrent of resentment.⁵³⁶ In the same interview, Ron Harfleet, reflected on his role as a measurer⁵³⁷ for ladders:

When I changed over to the Finance Department ... what they [the workers] did you measure. Now the Ladders not only lagged the pipes, they took the old lagging off. Now the people who negotiated the [piecework] scheme said “right, pipes” (I’m making money up now) “two shillings for every yard off”. Of course they thought the men would go up there on scaffolding, undo the clips, lift it off and put it out for waste, ‘cause it was a night shift job. But they didn’t, they went in there with hammers and smashed the asbestos so it fell and believe you me that fog was thicker than a London one before the [Second World] War ... Now as Measurers we were on night shift and we had to go and measure what they done; boiler rooms and engine rooms. And you’d walk through this [fog] ... and you’re breathing all this down all the time... I got to know [the ladders] well because I was measuring them, over the years in the local paper you’d see the obituary and they’d all died of asbestos because there’s no way they could avoid it.⁵³⁸

Under the piecework scheme, a ladder could earn more by using a hammer to destroy the asbestos in the way described by Harfleet than to carefully unclip it and lift it from its fixings. This is supported by Lewing’s testimony regarding removing smaller amounts of asbestos around components, such as valves. While Jenkins and Bond explained that they would smash asbestos off with hammers and were not provided with warning nor protective equipment, Lewing reveals that it was officially the job of a ladder to remove even small amounts of asbestos, but that in order to avoid lost earnings tradesmen were often loath to wait for a ladder⁵³⁹:

On the smaller jobs in particular, and being on piecework, rather than book waiting time, we would delag the valve/component ourselves rather than wait for a ladder this was common [practice]. Delaging required smashing the lagging off with a hammer and chisel. We would then continue working sometimes ankle deep in lagging.⁵⁴⁰

⁵³⁶ Group interview G2003/3, 2 December 2003, at Chatham Dockyard

⁵³⁷ Measurers, as their title suggests, measured the work undertaken by tradesmen in order to work out their pay under the piecework scheme.

⁵³⁸ G2003/3.

⁵³⁹ Interview with Brian Jenkins and Joe Bond, 28 May 2009 at Chatham Dockyard Historical Society.

⁵⁴⁰ Email correspondence with Phillip Lewing 24 April 2011.

This is a further example of earning potential being put before safety.

One worker was exposed between 1959 and at least until 1972 and developed pleural plaques. On The Mirror's Asbestos Timebomb Campaign website, he stated that 'Despite the Ministry of Defence knowing the dangers of this evil stuff you were not told of its danger or given any safety equipment'. Solicitors acting on behalf of the dependents of an insulator employed between 1952 and 1984 claimed that he was unaware of the dangers posed by asbestos until after he left the MoD's employ. Examples of workers 'playing' with asbestos are also fairly common. Former fitter Robert Smith recalled working on the refit of HMS *Rame Head* in the early 1960s:

... it was here that I first encountered asbestos. In the machinery spaces on board ship it was commonplace, and we thought it hilarious to throw large quantities of asbestos at each other, like a snowball fight. Another party piece, usually by a visiting tradesman, was to give the asbestos pipe covers a hefty blow, which showered the immediate area with a blanket of asbestos dust – what fun!⁵⁴¹

This also happened in the private shipyards on the Clyde, where workers referred to it as 'monkey dung'. Johnston and McIvor observe that the '*machismo* culture' that their interviewees recounted may have been their 'way of rationalising their own feelings of guilt at having exposed themselves – and others – to risk'.⁵⁴²

Turner & Newall, the Admiralty and the Dockyards

It is certainly disconcerting to learn that this Department of the Ministry [The Admiralty] is so out of love with asbestos ...
Mr E. B. Gates, T&N, 1965⁵⁴³

The MoD's retreat from the use of asbestos from the late 1960s understandably sparked a great deal of concern among its suppliers. Indeed, the efforts that T&N expended in 1965, in order to persuade the MoD that asbestos could be used safely, seem in direct contravention of Samuel Turner's directive in 1932, 'that his company should everything

⁵⁴¹ R. Smith *A Dockyard Apprentice's Story: Hard graft, scrapes and japes on the long road to becoming a trained engineer* (Gloucestershire: Memoirs Publishing, 2012), p80.

⁵⁴² Johnston and McIvor 'Dust to Dust', p53.

⁵⁴³ T&NA, internal letter from Gates to Edmonds, 30 November 1965.

possible regardless of the cost to safeguard the worker'.⁵⁴⁴ There are several examples of T&N obtaining confidential information from sources inside the Dockyards. In December 1965, they received advice from Empson that a letter to the Medical Director General (Navy) should suggest:

... that it might be helpful if a meeting could be arranged to discuss the medical problems associated with the use of asbestos. His reason for proposing this course of action is that there has been, of late, an exchange of correspondence between the medical officers in the dockyards and the Medical Director General's department, on this subject.⁵⁴⁵

Commenting that it would 'probably be fair to say that ... the medical officials in the Dockyards play down any asbestos risk', Edmonds advised that a visit from T&N's Dr Knox should be suggested in the hope that a wider discussion including the Dockyard authorities would result.⁵⁴⁶

In 1966 Edmonds visited Bath and Devonport Dockyard and a Mr Humphreys went to Chatham Dockyard, both were tasked with finding out more about the concerns that the MoD had with asbestos. Mention is made in Edmonds' visit report that Empson had been told to include information regarding the best way to deal with asbestos hazards in a manual issued to all HM ships. Edmonds also met with Mr Couzens, Assistant Director (Personnel), at Bath. Couzens informed that the unions had requested, through the MoL, that asbestos should not be used on HM ships and that:

The Ministry of Defence considers this approach to be unfounded, and that it may well be related to a wish by the unions to get more money for men engaged in the handling of asbestos.⁵⁴⁷

Though Edmonds insinuated that Couzens' claim may be untrue, it was certainly not unusual for workers to be paid extra for undertaking dangerous or unpleasant work, as was shown in Chapter 4.

⁵⁴⁴ Bartrip *The Way From Dusty Death*, p271.

⁵⁴⁵ T&NA, internal letter from Edmonds to Mann, 7 December 1965, p1.

⁵⁴⁶ T&NA, internal letter from Edmonds to Mann, 7 December 1965, p2.

⁵⁴⁷ T&NA, internal T&N memorandum from Edmonds to Mann 25 February 1966, p2.

At Devonport, Edmonds spoke to Mr Mitchell, Foreman of the Lagging Department and Mr Philpott, Inspector of Lagging. They highlighted a failure among ladders to use protective masks when undertaking asbestos spraying, but that recently a hard line had begun to be taken with anyone who disobeyed this instruction. New laundry arrangements were being investigated so that all overalls could be washed on site instead of sending them out for laundering. Workers were not permitted to take their overalls home, indeed the Crown had paid for the laundering of overalls at least from the late nineteenth century.⁵⁴⁸ T&N also courted Harries in an effort to keep an eye on his research findings. Meetings were held between Harries and T&N and Harries even circulated conference papers to the company before delivering them to his peers. On one occasion he asked the company to let him know of any tricky questions in advance so that he might be prepared. Between the research that Harries was undertaking and the contemporary publicity of asbestos hazards, T&N began to work hard to try to convince the Admiralty that safer versions of their products were preferable to non-asbestos alternatives. Separate meetings were held with different Dockyards to trial new dust-suppressed products as well as T&N's own glass fibre cloths (the company was not keen for the MoD to switch to less profitable glass fibre cloth, but was determined that if the decision did come, then the MoD should buy its glass cloth from T&N rather than one of the company's competitors). Conversely, trials at Devonport revealed that T&N's new 'dust-suppressed' asbestos cloth recorded an alarming fibre count of 660f/cc when manipulated during normal working conditions.⁵⁴⁹

In 1965 the Navy began to trial glass cloth alongside asbestos cloth in the newly launched Leander Class Frigate, HMS *Sirius*.⁵⁵⁰ T&N was understandably concerned and *Sirius* is mentioned in much of the correspondence. The company was invited to visit the ship after four months of steaming and after doing so commented that the:

Asbestos showed up well and pipes lagged with Asbestos/Navicote were less cracked than those in Glass/Navicote. This is probably due to the better key the Asbestos gives and also its greater cushioning effect. Both Mr. Bell and Mr. Spratt [Portsmouth Dockyard] acknowledged the superior performance; they did say that they would probably do better next time they used Glass.⁵⁵¹

⁵⁴⁸ M. Waters 'The Dockyardmen Speak Out: Petition and Tradition in Chatham Dockyard, 1860-1906' in K. Lunn and A. Day (eds) *History of Work & Labour in the Royal Dockyards* (London: Mansell, 1999), p93.

⁵⁴⁹ Tweedale *Magic Mineral to Killer Dust*, p205.

⁵⁵⁰ HMS *Sirius* was launched at Portsmouth Dockyard on 22 September 1964.

⁵⁵¹ T&NA, internal T&N memorandum from Edmonds to S Marks, 9 November 1966 Ref EAE/DEG, p2.

The trial on *Sirius* revealed a further and persuasive argument for the substitution of glass for asbestos: it would achieve a financial saving of £30k per annum, which was the equivalent to the cost of lagging one frigate.⁵⁵²

The Admiralty banned the use of asbestos cloth in 1969 and by 1970 a number of asbestos products had been replaced with alternatives. It should be noted, however, that whilst taking this admirable step in the protection of its workforce, it was agreed with T&N that lagging with asbestos cloth would continue until the contract with them expired in June 1970. The MoD also committed to taking Admiralty grade stock off of T&N's hands.⁵⁵³ Whether this action was sanctioned at the highest levels or whether it was the decision of pro-asbestos Dockyard management further down the chain, is unclear. It is certainly possible that cancelling the contract would have incurred financial penalties.

Measures introduced by the Dockyards

In the Royal Navy asbestos has been, and still is, widely used for insulating ships. The stripping of asbestos during the refitting of ships is particularly associated with dust; and because much refitting is done in HM Dockyards a large number of men are at risk. As explained above, it is now realized that this does not only mean those dockyard employees officially designated as asbestos workers but the much larger number who may be doing quite different tasks in the vicinity but who, nevertheless, are inhaling the dust. This number includes not only civilian personnel but also members of the ships companies.⁵⁵⁴

E James for MDG(N) 5 November 1965

As the opening quote of this chapter highlights, sufficient protection from asbestos dust for neighbourhood workers and management in the Dockyards was not in place before 1967, despite acknowledgement of the risk in 1965. Harries' comments were supported by the Navy Law Division, which stated that the measures that had been in place until the late 1960s and their enforcement by supervisors 'fell far below the standards now considered necessary'.⁵⁵⁵ The safeguards that the Dockyards introduced thereafter did, however,

⁵⁵² T&NA, internal note of telephone conversation between Mann and Mr Wilson, Sales Director, 10 June 1966. Refers to secret MoD report leaked to T&N.

⁵⁵³ T&NA, internal correspondence from Mann to Holmes 30 January 1969.

⁵⁵⁴ ADM 329/8 letter by E James for MDG(N), 5/11/1965.

⁵⁵⁵ BA 27/318.

predate the Asbestos Regulations, 1969. This section looks at the actions leading to and decisions regarding the protective measures introduced after 1967.

Firstly, it should be noted that some protection was provided before 1967, though this was predominantly for asbestos workers. The 1931 Regulations provided protection for just one in nine classified workers in the Dockyards.⁵⁵⁶ In 1944, AS Portsmouth recommended that ‘persons engaged on sand blasting and asbestos work should be medically examined at regular intervals’.⁵⁵⁷ No records were found to suggest that AS Portsmouth’s recommendations were taken up at the time. In 1952, however, Robert Frederick, Adviser on Applied Hygiene to the Medical Director General of the Royal Naval Medical School, observed the 1931 Act should apply to SLA work (this type of work was not covered by the Regulations due primarily to the fact that SLA was developed too late for inclusion, but it was an incredibly dusty process).⁵⁵⁸ By 1956 the Admiralty was applying the 1931 Regulations for SLA workers in the Dockyards.. BR 2101, *Management Regulations for H.M. Dockyards and Other Admiralty Civil Establishments*⁵⁵⁹ required that ventilation equipment, pre-damping equipment and respirators be provided for SLA workers. Workmen were not permitted to remain in the area being sprayed during meal breaks and there was some direction concerning cleaning up asbestos debris. There was also a requirement for designated asbestos workers to undergo medical examinations before employment and at six monthly and yearly intervals thereafter. Records were to be maintained. Some rudimentary protection was also included for neighbourhood workers, requiring that they vacate the sections being sprayed and not re-enter until 15 minutes after spraying had ceased. This was a particularly ineffective measure given that the dust would remain airborne for much longer than 15 minutes. One Clydeside lagger commented on his experience during the Second World War:

After spraying was a’done we would go in and cement it ... If you went in to this place days and days after the sprayers had finished, and you’d see maybe a streak of sunlight coming through ... It never ever left.⁵⁶⁰

⁵⁵⁶ Johnston and McIvor *Lethal Work*, p92.

⁵⁵⁷ TNA, ADM 1/20564 *Silicosis and Asbestosis: Sandblasting* 1944. Letter reference: L. 12410/44.

⁵⁵⁸ Bartrip *The Way From Dusty Death*, p323.

⁵⁵⁹ RDL, BR 2101 *Management Regulations for H.M. Dockyards and Other Admiralty Civil Establishments* 1956, 10 c 4 (15).

⁵⁶⁰ Johnston and McIvor *Lethal Work*, p87.

As laudable as the concern for SLA operators was, the manual did not include procedures for any other asbestos work until 1961, when the title of the section dealing with asbestos was amended to include the wording ‘and any other process involving the use of asbestos’.⁵⁶¹ This extended the provisions of the 1931 Regulations further beyond their intended scope, yet still did not provide adequate protection, particularly for neighbourhood workers.

Further amendments occurred between 1961 and circa 1972/3, but the wording remained remarkably similar until 1974, with just the inclusion of an instruction that overalls contaminated with asbestos were to be laundered by the Dockyard and placed in paper sacks with specific warnings about the contents: ‘WARNING-CONTAINS ASBESTOS CONTAMINATED CLOTHING’.⁵⁶² By 1974 the section was simply titled *Precautions Against Asbestos Dust* and included specific references to ‘Management Visitors and non-registered workers’, the latter obviously being neighbourhood workers.

Though BR 2101 was updated regularly and amendments were supposed to be filed within the manual as they were issued, the reality may have been much different. None of the several copies of the manual reviewed for this study held the same version of the asbestos section. In some copies changes had been pasted in, in others they had been correctly filed, but did not have the most up-to-date amendments and one manual still had the original 1956 version of the instructions. It is impossible to know whether the manuals were actually in use containing out of date information, but the possibility has to be considered along with other evidence suggesting that management and supervision were lacking in terms of safeguarding employees against asbestos dust. Other manuals that detailed precautions for working with asbestos included: *Protective Clothing & Equipment Handbook* 1969, *Marine Engineering Manual BR 3000* and *Marine Engineering Technical Instructions BR 3001* 1973.⁵⁶³

Registered asbestos workers were provided with regular medical examinations. In the absence of examples for Chatham Dockyard workers, the records of three Devonport Dockyard workers have been examined. The first, a lagger, underwent ‘examinations for

⁵⁶¹ BR 2101, 10 c 4, L. 738/61 Amendment No 15

⁵⁶² BR 2101, 10 c 4 (11) Ref Change 29

⁵⁶³ Copies are held at RDL.

continuing employment on asbestos lagging' in 1961, 1962 and 1963. The examinations did little to protect him, however, as he died in service from mesothelioma and asbestosis. Another lagger's records included an 'Asbestos Workers Card', which stated occupational and medical histories plus the date that he started working with asbestos. The reverse of the card detailed medical complaints and examinations including observations on weight and appearance of skin plus details of any X-rays. Asbestos Worker Annual Medical Request slips were also on the file for 1959, 1960, 1962, 1963, 1964, 1965, 1971 and 1974. This worker also took part in Harries' study and the file includes the questionnaires that he completed and the results of lung function tests etc. The third and final file examined also included evidence of regular medical checks.⁵⁶⁴ It can be reasonably assumed that registered asbestos workers at Chatham Dockyard also underwent similar checks and that similar records were held for them.

In *Asbestos Hazards in Naval Dockyards*, Harries summarised the measures adopted by the MoD following his first study. The use of asbestos materials was reviewed, with alternatives being sought and introduced where practicable. Table 5.11 shows the progress with this at 1970. Where substitution was not possible, precautions were set out and protective equipment made available to avoid exposure to dust. By 1968 work was segregated and filtered supply and exhaust ventilation was provided where possible. Harries also explained that, as dust suppression was impossible afloat, protective equipment was relied upon to minimise the risk to workers. The equipment comprised PVC or rubber impervious overalls and air-fed PVC hoods, supplied with fresh air via the Dockyard's compressed airlines (see figures 5.2 and 5.3).⁵⁶⁵ Positive Pressure Powered respirators manufactured by Martindale Electric Co. Ltd. were on trial in the late 1960s. These provided filtered air without the complication of trailing air hoses. Siebe Gorman Mark VIII dust respirators and Bri-Nylon overalls were provided for the application of lagging and sound insulation.⁵⁶⁶

The cleaning up of asbestos debris also became the subject of procedure. Waste was carried off the ship at the end of working hours. Once the bags were off the ship, they were pierced with a probe, filled with water and placed on a barge, eventually being

⁵⁶⁴ From the MoD Devonport Civilian Occupational Health Record Archive.

⁵⁶⁵ Harries *Asbestos Hazards in Naval Dockyards* p140.

⁵⁶⁶ Harries *Asbestos Hazards in Naval Dockyards* p140.

dumped at sea. The ship's compartments were then cleaned with an industrial vacuum cleaner by men wearing full protective clothing (see figure 5.4).

Working With Asbestos was published in 1970. Its aim was to increase awareness of the dangers of asbestos and clarify Admiralty policy. It was prefaced with a message from Dr David Owen, MP, Parliamentary Under-Secretary of State for Defence for the Royal Navy from 1968 to 1970 (Owen was also MP in Plymouth Sutton before this post and subsequently MP for Devonport). He claimed to have asked for the booklet to be prepared 'so that everyone will be aware of the dangers of working with asbestos and of the precautions they should take for their own protection and to safeguard the health of their fellow-workers'.⁵⁶⁷ Readers were warned about asbestosis and cancer including mesothelioma. Whether its focus on crocidolite as the offending type of asbestos was a reflection of contemporary understanding of the risks or whether it was propagandist is unclear. The opportunity was certainly taken to inform the reader that crocidolite was no longer used in naval new construction.

Table 5.10 was included in the booklet to show alternative materials being used on ships and also where asbestos was still to be found. By 1970, the amount of asbestos being used in naval ships was one-tenth of what it had been in 1966.⁵⁶⁸ The booklet stated that 'it is unlikely that we shall ever be able to do without asbestos entirely'.⁵⁶⁹ It does, however, show that the MoD was aiming to do without asbestos in many areas.

The precautions detailed in *Working With Asbestos* included segregation of asbestos work; dust reduction; protection for all employees and not just registered asbestos workers; maintenance of a register of asbestos workers; provision of cleaning and decontamination; carrying out regular dust sampling and provision of protective equipment. Workers were also reminded of their personal responsibility to follow instructions and to use the protective equipment provided.⁵⁷⁰ The publication represented a top-down method of dissemination, comparable with the public information pamphlet distributed to local residents near the Carrington petrochemical complex, Greater Manchester, in the 1980s. Irwin described the latter as intentionally devoid of references to scientific complexities and

⁵⁶⁷ Ministry of Defence (Navy) *Working with Asbestos* 1970, p1.

⁵⁶⁸ Ministry of Defence (Navy) *Working with Asbestos* p2.

⁵⁶⁹ Ministry of Defence (Navy) *Working with Asbestos* p2.

⁵⁷⁰ Ministry of Defence (Navy) *Working with Asbestos*, pp6-7.

uncertainties in order ‘to avoid local confusion or unnecessary panic’; that it was presented in an authoritative fashion without any encouragement of debate or discussion; and that it had the effect of informing rather than empowering recipients to take measures to protect themselves.⁵⁷¹ Similarly, Needleman found issues with the Asbestos Awareness Campaign, launched in the US in 1978. This information was intended to inform the general public and especially people who had worked in shipyards during the Second World War of the risks of asbestos exposure, but in a way that was supportive and non-threatening to those at risk. Needleman argues that while the public could be assumed to be *informed* of the risks, it did not help them to protect their own health. Further, even where the messages were received and understood, few individuals would take the recommended actions to protect themselves, such as stopping smoking, thus rendering the campaign largely ineffective.⁵⁷²

Articles mentioning asbestos began to appear in Chatham Dockyard’s newspaper, *Periscope*, in the late 1960s. The September 1969 edition, for example, included an article titled *For safety, comfort and working to plan, Keep ships and berths spick and span*. This advised the use of portable clean air units for filtering pulverised cement/asbestos dusts when delagging. It also stated that asbestos dust should be regularly cleaned up using a ‘Jet Vac’ and that asbestos debris should be collected in ‘approved paper sacks for special disposal’. Finally it mentioned the protective wear that registered asbestos workers should use.⁵⁷³ The previous edition had shown D. Chandler in full protective garb (see figure 5.2). The July 1977 issue of *Periscope* included a review of an instructional film titled *Dust in Dockyards*. The film had been premiered before an invited audience in the Old Admiralty Cinema, Whitehall. According to the reviewer, the film showed ‘just what the dangers are and the steps that are taken to overcome them ... [and] that the Dockyards are only too well aware that shipbuilding and repairing is a high risk business’.⁵⁷⁴ Viewing of the film did not appear to be compulsory for workers and though the reviewer was of the opinion that it deserved a wide showing, there was no advice as to where it could be viewed. The film was produced by Millbank Films and directed by L. Gordon Begg. It was sponsored by the

⁵⁷¹ Irwin *Citizen Science*, p83-6.

⁵⁷² C. Needleman ‘Ritualism in Communicating Risk Information’ *Science, Technology & Human Values* 12:3/4, p23.

⁵⁷³ *Periscope* September 1969, p5.

⁵⁷⁴ *Periscope* May 1977, p9.

Royal Navy.⁵⁷⁵ The February 1978 issue of *Periscope* included a very short item titled *Asbestos-assurance*, which reported that the Secretary of State for Defence, Pat Duffy, had given assurance that Dockyard employees were given full protection from the possible hazards arising from working with asbestos and that the safety precautions provided were 'well up to recognized international standards'.⁵⁷⁶ This statement had been provided as a written answer to a question by MP Freddy Burden in the House of Commons on 13 January 1978. Burden had asked what new precautions had recently been introduced in the Royal Dockyards to protect men working with asbestos. Burden further enquired whether Duffy was satisfied that the equipment available and the precautions in force gave full protection from asbestos. Duffy's response was that the precautions at the Dockyards had been in place for some time and that though they were kept under review, no new precautions had been introduced recently. He stated that a wide range of protective equipment was available to employees required to work with asbestos and that he was satisfied that Dockyard workers were given full protection from the possible hazards arising from working with asbestos.⁵⁷⁷ Three years earlier, Harries *et al* had claimed that the small number of men working with asbestos following the measures introduced to replace much of the asbestos used in warships, 'can now be regarded as unexposed because of the stringent precautions enforced for their respiratory protection'. They included the caveat that a very small risk still existed from the possible failure of protective equipment or risks introduced by new materials that were as yet unknown.⁵⁷⁸

It is clear from the sources reviewed that working conditions, precautions and awareness improved after 1967. Certainly more information was available, but this was only effective if workers had easy access to it. None of the information sources described above were mentioned by respondents to the study's initial questionnaire. Of the seven respondents to the detailed asbestos questionnaire, two recalled having access to BRs and two remembered receiving a copy of *Working With Asbestos*. These men worked at the Dockyard into the late 1970s. None of the respondents recalled seeing *Dust in Dockyards*.

⁵⁷⁵ British Film Institute online Film and Television Database: <http://ftvdb.bfi.org.uk/sift/title/193775> [accessed 21 September 2010].

⁵⁷⁶ *Periscope* February 1978, p9.

⁵⁷⁷ Guildhall Library, Hansard (Commons) 1977-78, Vol 941, Written Answers Col 835.

⁵⁷⁸ Harries *et al* *Royal Naval Dockyards Asbestosis Research Project*, p344.

As mentioned elsewhere in this thesis, the Dockyards provided education for apprentices and other training. After 1967 this included presentations on the asbestos hazard. Clive Stanley, an apprentice engine fitter/draughtsman between 1970 and 1978 recalled that ‘As apprentices, we had lectures and warnings about asbestos dangers’.⁵⁷⁹ Stuart Gregory, an electrical fitter between 1963 and 1982, attended lectures on the subject after 1967.⁵⁸⁰ Andrew Easdown, shipwright apprentice/draughtsman between 1976 and 1982, recalled being given a health and safety presentation, during which the dangers of asbestos were discussed, when he first joined the Dockyard.⁵⁸¹

By the 1970s it does appear that the workforce as a whole was much better informed. Easdown, noted that ‘There were strict controls about working with asbestos, which were introduced in the late ‘70s’. He also believed that conditions had improved significantly in the 1970s and 1980s.⁵⁸² Even when the message seemed to be getting through, however, there is evidence that it was still not always fully understood by all workers. An electronic diagnostician employed between 1970 and 1982 stated:

A lot more fuss was made in the removal of asbestos over the years, but we were not always aware of what to look out for.⁵⁸³

While the sample is very small, it suggests that some information sources did reach at least some of the intended audience. When we look at all of the sources together, however, it becomes apparent that there were problems with enforcement, supervision and even comprehension of the risk. The discomfort and obstruction caused by respirators and other safety wear combined with the intangible nature of the risk (indeed many asbestos fibres were invisible to the naked eye and the victim would rarely notice that they were inhaling them) often resulted in them not being used. Harries acknowledged that the protective equipment introduced difficulty and discomfort in work.⁵⁸⁴ Problems with supervision were recognised as early as 1961 and the words “and strict supervision is to be exercised to

⁵⁷⁹ Questionnaire ARD3.

⁵⁸⁰ Questionnaire ARD4

⁵⁸¹ Questionnaire ARD5

⁵⁸² Questionnaire 1000

⁵⁸³ Questionnaire 25.

⁵⁸⁴ Harries *Asbestos Hazards in Naval Dockyards*, p140.

ensure that these are used” were added to the instruction in BR 2101 regarding the use of respirators. In 1965, MDG(N) advised that the AS of the Dockyards must be instructed that ‘particular care should be taken to ensure that all the prescribed precautions are indeed taken and supervised’.⁵⁸⁵ Indeed, the covering note sent to the AS with Byrne’s *Sunday Times* article included the following instruction:

I am directed to draw your attention to the recent publicity which has been given in the National press about the use of asbestos and to the need to ensure that existing safeguards, set out in current regulations, about the use of asbestos be thoroughly and strictly applied and supervised.⁵⁸⁶

Besides discomfort, workers had other reasons for not following safety precautions. As established in Chapter 4, without a patent and immediate risk, it could be difficult to persuade workers to use safety wear, particularly if it hampered them in their work (and therefore earning ability) or was uncomfortable.

The motivation for protection

The following factors are put forward as a means to contextualise and evaluate the protection offered to workers. The first factor is the legislative environment; i.e. did the Navy fulfil its legal obligations? As established earlier in this chapter, the legislation covering the asbestos hazard included: The Asbestos Industry Regulations, 1931; followed by the Shipbuilding and Ship Repairing Regulations, 1960; The Asbestos Regulations, 1969 and then by the Health and Safety At Work Act, 1974. The 1931 Regulations protected very few Dockyard workers and certainly not those employed on SLA work. Despite this, the Admiralty applied the 1931 Regulations for SLA workers at least from 1956 and showed limited concern for neighbourhood workers during the SLA process. Later in 1965 the MoD launched studies into the occurrence of ARDs among its workers and by 1967 had begun to put in place measures to protect all workers from asbestos dust. This was ahead of any legal obligation brought in by the 1969 Regulations and was over and above what was required by the Shipbuilding and Ship-Repairing Regulations, 1960.

⁵⁸⁵ADM 329/8

⁵⁸⁶ ADM 329/8 covering note addressed to Admirals Superintendent of home Dockyards, titled *Precautions When Using Asbestos* 11 November 1965 from Admiralty, Bath.

Significantly, though the 1969 Regulations introduced an upper limit for asbestos fibre concentrations in air samples, the threshold was not implemented immediately and asbestos textile factories continued to operate above the limit as late as 1974.⁵⁸⁷ Devonport Dockyard, as the home of Harries' studies, is referred to by Castleman as an employer that took extra measures despite the watering down of the Shipbuilding and Ship-Repairing Regulations, 1960.⁵⁸⁸ In terms of protection for workers from the asbestos threat, it can be concluded that the Admiralty did more than was required of it by law, even if these measures were wanting.

Another consideration is whether the Admiralty did as much as its counterparts in the private sector. The evidence reviewed during the study suggests that the Admiralty did more than private shipbuilders in the United Kingdom. In *Bryce v Swan Hunter Group plc. & Others* in 1988, the measures introduced in the Dockyards were held up as an example of what the defendants (private shipbuilders: Swan Hunter Group plc.; Vickers Armstrongs Ltd.; and Vickers Armstrongs (Shipbuilders) Ltd., Tyneside) should have done to prevent the plaintiff from developing mesothelioma. Lord Phillips agreed with expert witness, Factory Inspector Mr Finch, that there was no reason why the company should not have adopted similar precautions to those detailed in Harries 1971 article.⁵⁸⁹ Another private shipbuilder, John Browns, Clydebank, made some improvements to working conditions in the 1960s, but these were compared unfavourably with the precautions introduced by the Dockyards. Johnston and McIvor mention that, unlike Scottish private shipbuilders, the Dockyards offered the 'systematic provision and regular maintenance and cleaning of respirators' for asbestos workers.⁵⁹⁰ In interviews with former Clydeside workers, they found that even when Scottish employers were duty bound to provide masks, many workers remained unprotected into the 1970s and 1980s, particularly those who were not employed directly by the insulation industry.⁵⁹¹

The navies of the United Kingdom and the United States of America often consulted each other over issues of mutual interest. The US Navy worked closely with the

⁵⁸⁷ Tweedale *Magic Mineral to Killer Dust*, p209.

⁵⁸⁸ Castleman *Asbestos: Medical and Legal Aspects*, p311.

⁵⁸⁹ Lexis Nexis *Bryce v Swan Hunter Group plc. and others* 1987.

⁵⁹⁰ Johnston and McIvor *Lethal Work*, pp91-2.

⁵⁹¹ Johnston and McIvor *Lethal Work*, pp126-7.

Royal Navy for much of the Cold War period, particularly with regard to the Polaris submarine-launched ballistic missile system.⁵⁹² It is likely that the two navies communicated over other pertinent matters and by 1970 there is evidence to suggest that this was the case with regard to the asbestos threat. A Commander Lewis, RN, spent three weeks in North America and during that time was questioned by his opposite number in Washington about the practicability of eliminating asbestos from ships. Lewis, who was in favour of continuing the use of asbestos cloth for lagging in the UK, contacted T&N on his return to request information to send back to the US.⁵⁹³

How did the MoD's precautions compare with those of other navies? The US Navy commenced screening of 'all workers employed in handling asbestos' in 1939 and during the Second World War some Dockyards advised that respiratory protection should be used, but this was not enforced. In 1942, Phillip Drinker commented on the inevitability of ARDs in American shipyards: 'we rather expect it to occur in shipyards, because we have seen asbestos being handled in installation with little or no precautions'.⁵⁹⁴ The US Navy's publication *Minimal Requirements for Safety and Industrial Health in Contract Shipyards*, 1943, required that dusty work be segregated, that respirators and exhaust ventilation be used and that workers handling asbestos insulation materials undergo periodical medical examinations.⁵⁹⁵ At this time, the UK was fully engaged in war, which impacted on all areas of Health and Safety. At the close of the Second World War, W. E. Fleischer *et al* conducted their *Survey of Pipecovering Operations in Constructing Naval Vessels*, which involved chest X-rays and dust surveys at four US Navy shipyards. Their study sample totalled 1,074 men. Although exhaust ventilation was recommended for the sawing and grinding of asbestos and for cement mixing and installation of asbestos on ships, it was concluded that pipecovering was 'not a dangerous occupation'.⁵⁹⁶ Later in 1979 Selikoff *et al* conducted a study of US shipyard workers, finding significant rates of ARD across

⁵⁹² See J. E. Moore *The Impact of Polaris: The Origins of Britain's Seaborne Deterrent* (Huddersfield: Richard Netherwood Ltd, 1999) and P. Nailor *The Nassau Connection: Organization and Management of the British Polaris Project* (London: HMSO, 1988).

⁵⁹³ T&NA, internal communication from Gates, 31 July 1970 and titled Asbestos & Health: Admiralty.

⁵⁹⁴ Bartrip *Beyond the Factory Gates*, p21.

⁵⁹⁵ Castleman *Asbestos: Medical and Legal Aspects*, pp222-232.

⁵⁹⁶ Castleman *Asbestos: Medical and Legal Aspects*, p404.

trades very similar to those in UK shipyards.⁵⁹⁷ By 1975 asbestos use had dramatically declined in US shipyards.

Cases of mesothelioma in non-asbestos workers were also found in European shipyards. Stumphius' study of the N.V. Koninklijke Maatschappij 'de Schelde' (Royal Schelde) shipyard in Vlissingen, Netherlands, found 25 cases of mesothelioma among its workers between 1962 and 1968; a rate per 100,000 workers that was much higher than in other Netherlands heavy industry.⁵⁹⁸ Stumphius stated that alternatives to asbestos sprays were in use in the Netherlands shipyards, but that asbestos containing materials were being used in other areas of shipbuilding, including Marinite, a fire-proof plaster board, which was fitted by carpenters.⁵⁹⁹ Stossel found 27 cases of mesothelioma between 1964 and 1969 in Wilhelmshaven, Germany, the majority having worked in the local naval dockyard.⁶⁰⁰ These examples from US and European shipyards confirm that the asbestos problem was international. They also show that, while protective measures were introduced they were not always enforced and ARD was still contracted by workers. This suggests that the inadequacies in the UK Dockyards were not unique. The reason that The Netherlands chose an alternative to asbestos spray coatings is unknown, but the prevalence of asbestos building materials there also resulted in a relatively high rate of mesothelioma among shipyard workers.

Economically, the threat of contraction and closure hung over the Dockyards throughout the post-1945 period. As has been covered elsewhere in this thesis, the 1950s and 1960s saw ever-decreasing budgets for conventional naval ships in favour of the nuclear deterrent, leading on several occasions to Dockyard closures and reductions in workforce numbers. This makes the MoD's decision, to invest in protective equipment and to introduce health and safety practices over and above those required by law and which delayed refits and repairs, all the more interesting. The threat of legal claims was unquestionably a motivating factor. The scarcity of legal reports for asbestos claims against the MoD is the direct result of its policy to settle out of court, as referred to by the

⁵⁹⁷ I. Selikoff. *et al* 'Asbestos Disease in United States Shipyards' *Annals of the New York Academy of Sciences* 330 (December 1979), pp295-312.

⁵⁹⁸ J. Stumphius 'Epidemiology of mesothelioma on Walcheren Island' *British Journal of Industrial Medicine* 28 (1971) p59.

⁵⁹⁹ Stumphius 'Epidemiology of mesothelioma on Walcheren Island' p65.

⁶⁰⁰ Stumphius 'Epidemiology of mesothelioma on Walcheren Island' p65.

Naval Law Division in a letter to the Treasury in 1969. Indeed, cases were generally settled so long as the claimant could prove they had worked in the Dockyards. The letter reveals the concern over the number of current and potential claims from workers suffering asbestosis and other ARDs arising in Devonport at the time. It refers to the Dockyard studies by Harries *et al* and that these had indicated the potential for further claims in Devonport and from the other Dockyards:

Moreover, we have reason to believe that about 20 additional cases will be arriving from Devonport in the near future, and we know that about 45 men out of a random sample of 1,500 recently x-rayed show pleural thickening of the lung which, we are advised, is a strong indication of exposure to asbestos dust. Altogether a minimum of 6,000 men at Devonport have been exposed in one degree or other to asbestos dust over the past years and may develop the disease in the future. Investigations have been started at the Dockyards at Portsmouth, Chatham and Rosyth, and we have grounds for believing that from Portsmouth at any rate there will be a substantial number of claims.⁶⁰¹

According to Edmonds, Harries believed that Owen had involved himself in the policy decision to abandon asbestos because of the high cost of claims:

Dr. Harries had expected that a great deal more experiment would be done on glass before a decision was made not to use asbestos any-more. He considers that the interest of the Minister was sparked off by the very high compensation figures which brought everything to a head far more quickly than anyone could have anticipated.⁶⁰²

The Naval Law Division was unsurprisingly concerned by the potential cost of claims and of high pay outs for employees of the Central Asbestos Company in Bermondsey in 1970. As well as worrying that future claims might be for higher amounts, there is a suggestion that the highly publicised case might influence applications for old claims against the MoD to be re-opened in an attempt to gain further payment. The motivation of the MoD should at this juncture be juxtaposed to that of a private company with shareholders. While a budget had to be maintained and pressure would be applied by the Treasury in terms of minimising the cost to the public purse, the motivation of profit and maximising

⁶⁰¹ BA 27/318.

⁶⁰² T&NA, internal memorandum from Edmonds to Holmes, 26 March 1969.

shareholder dividends was not a factor for the MoD. Indeed, there was agreement between the MoD, Treasury Solicitor and Counsel that individual settlements should be fair to the claimant, reasonable to the public and should ensure that justice was done between different claimants.⁶⁰³

A major motivation for providing precautions against asbestos dust and also for keeping claims out of the press as much as possible was worker morale. In the introduction to this thesis it was established that the Navy invested a lot in training and maintaining the morale of its workforce. It was also established that the post-1945 period was one of continual challenge to morale. The public realisation of the hazards of asbestos represented another threat to the productivity and morale of the workforce. The maintenance of a skilled, loyal workforce remained important in the period, especially once the MoD was made custodian of the British nuclear deterrent.

Conclusion

The risk that asbestos posed to workers' health began to become apparent from 1898. It was not until 1931 that legislation first addressed the risk and many workers fell outside of the protection of the law until the Asbestos Regulations, 1969 came into force. The latency of ARDs meant that, in the nineteenth and early twentieth centuries, in comparison with some industrial hazards, ARD seemed to impact fewer workers.⁶⁰⁴ With this in mind the asbestos hazard should not be considered in isolation, but with an acknowledgement that industrial disease and injury had many unsavoury facets, some of which have been dealt with elsewhere in this thesis. For the Navy the catalogue of risks that presented itself within the Dockyards must also be put into context of the preservation of national security and the protection of the lives of naval personnel from other dangers at sea, both in peace and at war. It is possible, therefore, that in the early history of ARD, the attention of the Naval Medical Branch may have been concentrated in other areas. By 1931, however, the Navy was alive to the asbestos risk and certainly the Chief Inspector of Factories' letter of 1945 was explicit in setting out the risks to workers in the shipbuilding and ship-repairing industries.

⁶⁰³ BA 27/318

⁶⁰⁴ J. R. Russell 'Asbestos a failure?' *Her Majesty's Inspectors of Factories 1833 – 1983: Essays to commemorate 150 years of health and safety inspection* (London: HMSO, 1983), p38.

The evidence set out in this chapter has established that the Admiralty/MoD put in place some safeguards against the hazards of asbestos to Dockyard workers and that in many cases these were above and beyond legal obligations and those in evidence in private shipyards. The cessation of asbestos use was certainly ahead of private enterprises and the United States Navy (USN) and made a large dent in the income of the UK's largest asbestos manufacturer. It can be argued with some certainty that the level and cost of claims played a major part in the MoD's decision to stop using asbestos and that there was motivation to keep reports of claims out of the press. It is also quite clear that at a high and public level, the MoD was keen to be seen to be drastically reducing the use of asbestos in ships. At the same time, however, there remained strong supporters of asbestos cloth within the MoD and the Dockyards, Harries and Lewis among them. The decision to switch from asbestos to glass cloth does, as Harries identified, seem to have been done rather hurriedly, which suggests a mildly panicked drive to lessen claims and adverse publicity that resulted in the abandonment of the majority of asbestos products. Glass cloth was significantly cheaper than asbestos cloth, which can only have worked in the MoD's favour. Interestingly, today there are concerns as to the safety of glass fibre and further study may indicate whether Dockyard workers have suffered as a result of its use.

Where asbestos was still used or was still present (i.e. in older vessels), protective measures were introduced. Latterly this meant protective clothing and respiratory equipment for those involved in the work, plus segregation of work and detailed procedures for the cleaning of areas where asbestos had been used/removed before other work could resume. The research for this chapter has established a distinct gap between the measures introduced to protect workers and workers' knowledge of the risks they faced. While it has been shown that some workers did have a degree of knowledge of the risk that faced them, particularly those who worked beyond the late 1970s, there were others who maintain that they were clueless as to the threat to their health. Of course we must consider the problems of recollection and memory in oral history studies. We must also acknowledge that in legal reports and newspaper articles we may come across exaggeration in terms of the severity of conditions and even denial of knowledge for the purpose of avoiding accusations of contributory negligence in personal injury cases. There is also, no doubt, a degree of guilt where workers knowingly failed to implement safe working practices. The question must be asked, however, would these individuals have taken such risks if they fully understood

the dangers that they were exposing themselves to? The extent of energy and financial resources expended in training and communication methods is irrelevant if knowledge is not passed down the line or confusion is created and lives continue to be blighted through ignorance. The message failed to be delivered effectively and the implementation of safe working practices failed to be adequately supervised.

Short of scuttling the vessels that contained asbestos and removing all supplies of asbestos products from stores, the risk within the Dockyards could not have been totally eradicated; even Harries acknowledged that a risk remained from faulty equipment. Certainly the measures taken must have *reduced* the risk,⁶⁰⁵ but due to the lack of comprehensive knowledge at all levels and strict supervision, men and women continue to suffer and die today from asbestos-related diseases contracted during their employment at Chatham Dockyard between 1945 and 1984.

⁶⁰⁵ A further study using Devonport workers as a case study may confirm this.



Figure 5.0: Removal of asbestos pipe lagging in a ship's boiler room (Devonport Dockyard). This photograph illustrates some of the comments made by former Dockyard workers about the level of dust and debris around them when asbestos was being removed. As well as the dust that we can see in this photograph, there would have been airborne dust particles, small enough to be inhaled by workers. It was used by Harries to highlight how dusty the removal of lagging was in support of his MD thesis.

Source: P.G. Harries *The Effects and Control of Diseases Associated with Exposure to Asbestos in Devonport Dockyard* (MD Thesis) (black and white).

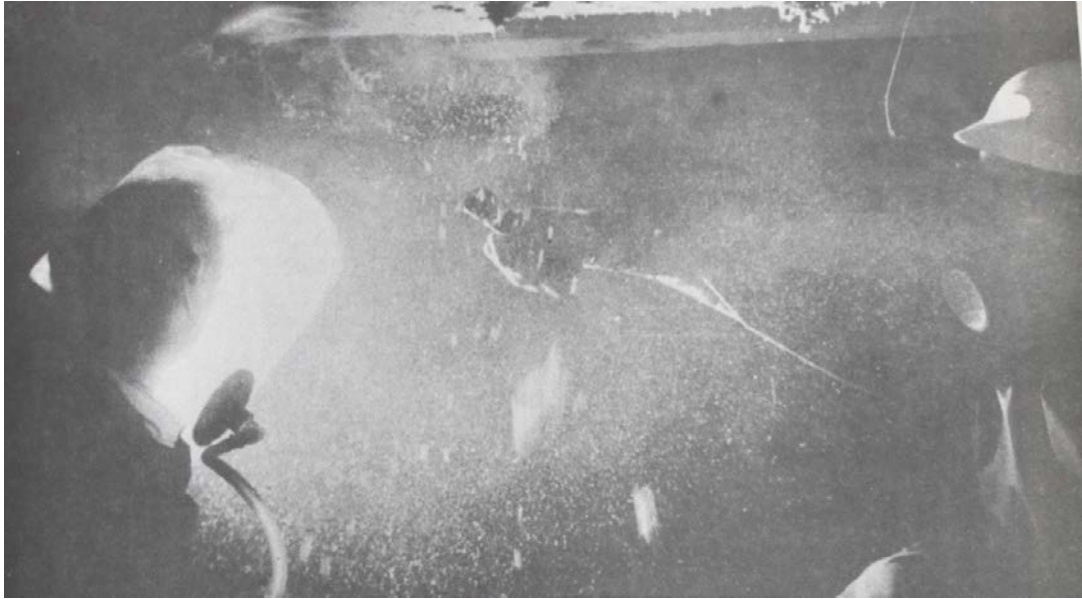


Figure 5.1 Shows airborne particles of asbestos while two workers are removing crocidolite aboard a ship. The dust sample taken at the time showed 1.012 asbestos fibres per cubic centimetre (f/cc). Again, this photograph illustrates the comments made by former Dockyard workers and while the workers here are wearing protective hoods and breathing apparatus, it is evident that some workers were exposed to dust clouds like this without any protection. It was also used by Harries to show the dusty nature of the work.

Source: Harries *The Effects and Control of Diseases Associated with Exposure to Asbestos in Devonport Dockyard*, p87 (black and white).



Figure 5.2 D Chandler, joiner, carrying out asbestos work using protective clothing and respirator. This photograph was printed in *Periscope* in August 1969 to publicise the protective measures that had recently been introduced. Compared to Harries' photographs, the work area in this image is remarkably clean.
Source: RDL (black and white).



Figure 5.3 Removing lagging. Here we not only see the fibrous asbestos being removed, but also the cramped and obstructive conditions that work was undertaken in. This provides some context for workers resisting bulky protective equipment that made their jobs harder and made hot and claustrophobic conditions worse.
Source: *Working With Asbestos* (black and white).

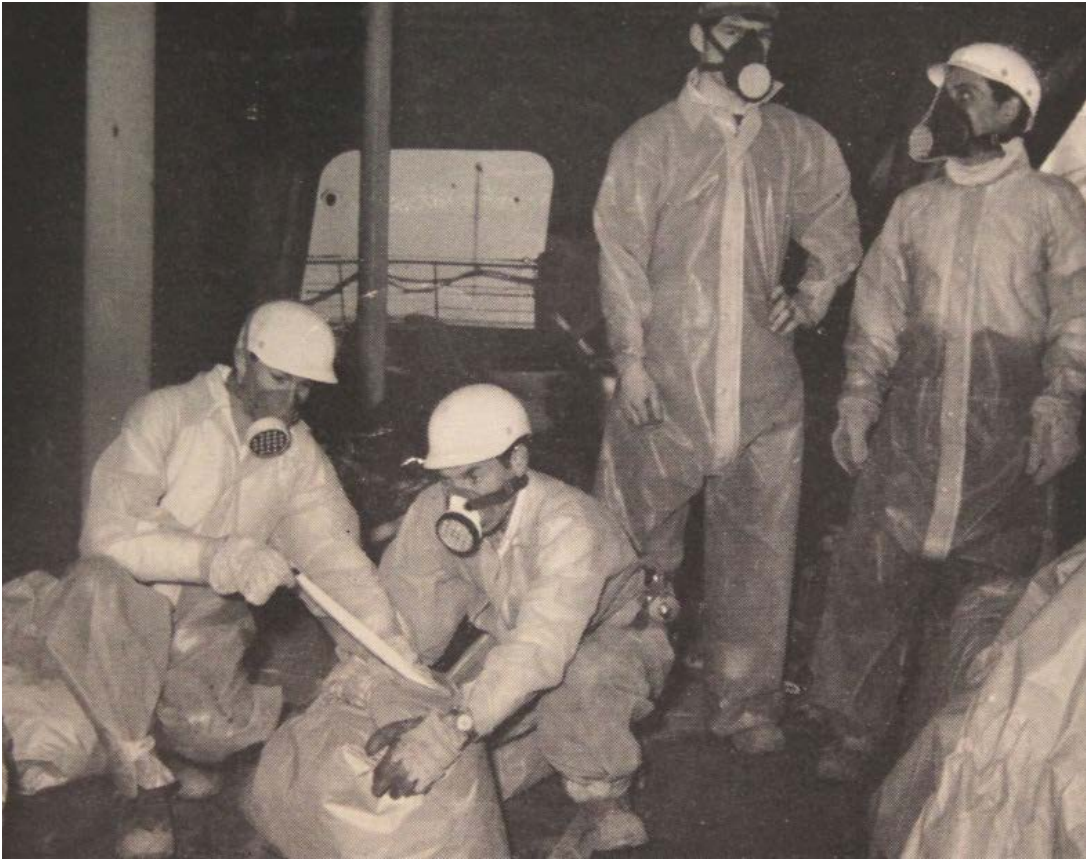


Figure 5.4: The cleaning up process. By the time this photograph was taken in the 1970s, cleaning up after asbestos work was undertaken was required and cleaners were provided with protection. Here one worker is injecting a sack full of asbestos debris with water to minimise the dust levels.

Source: *Working With Asbestos* (black and white).

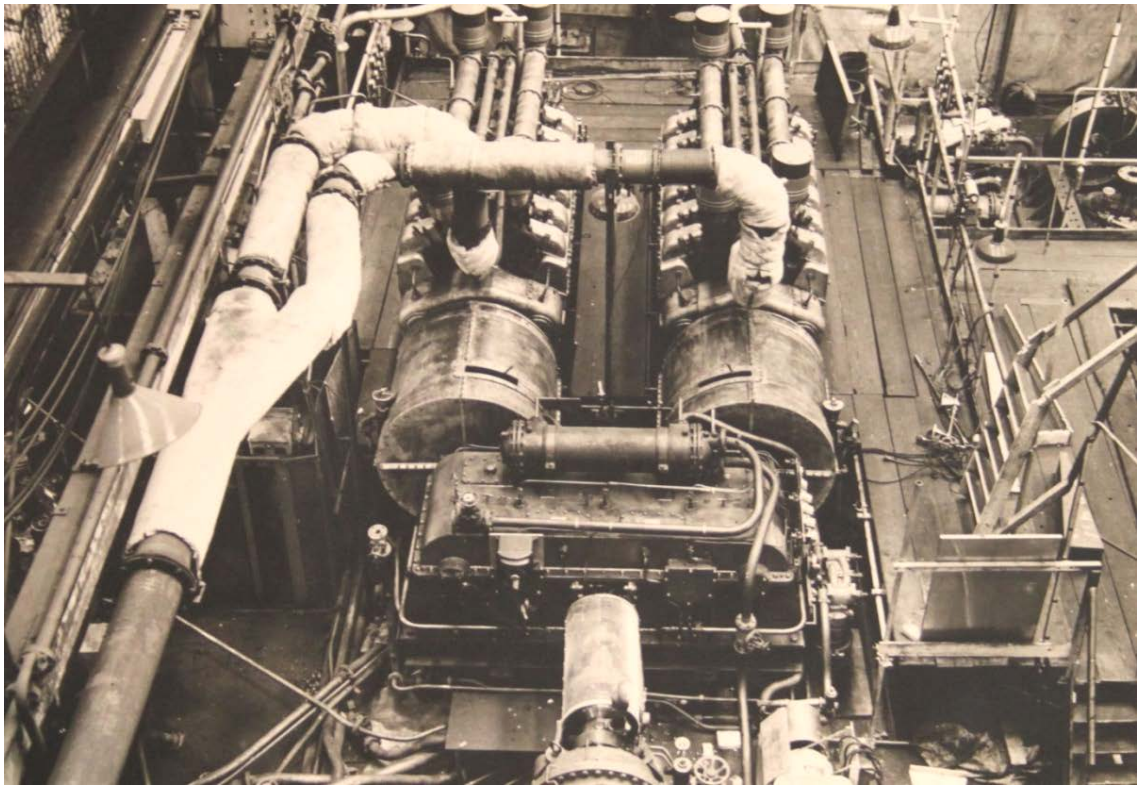


Figure 5.5: HMS *Vidal*'s engine, showing asbestos lagging of different types. This was a rare photograph of asbestos in situ in the RDL collection. The amount of asbestos visible is comparatively small as *Vidal* had a diesel engine. Steam powered engines had more hot surfaces and so more asbestos insulation was used. Source: RDL Photograph Collection (black and white).



Figure 5.6: Lady Asbestos. Used in advertising for asbestos products. Uses neo-classical imagery to depict asbestos as a heroic figure protecting the gods of industry from all-consuming flames. Source: T&N Archive (black and white engraving).



Figure 5.7: The Asbestos Lady. A Marvel super villain, who protected herself with asbestos clothing while she used fire to achieve her criminal ambitions.

Source: *The Invaders: Never Before Revealed!! The Untold Origin of Toro!* (Marvel Comics, November 1977), p17 (colour reformatted to grayscale).

Table 5.1	
Asbestos Materials Used in Naval Dockyards c1968	
Dusty	Non-Dusty
Asbestos: Blankets Cement Cloth (untreated) Cord Fibre Millboard Packing fibre Rope Soft sound insulation	Asbestos: Cloth (treated) Condenser packing Sheets (compressed fibre) Gaskets Oilproof jointing Compressed fibre jointing Graphited packing Rings Compressed sound insulation Jointing strips Tape Tubing Twine Webbing Washers Coated electric wire
Calcium silicate sectional lagging (up to 15% asbestos) Amosite sectional lagging (over 90% asbestos) Magnesia compound (up to 15% asbestos)	
Source: Harries <i>Asbestos Hazards in Naval Dockyards</i> .p137.	

Table 5.2					
Asbestosis Claims from Dockyard Workers 1969-1971					
Trade	Claims	Trade	Claims	Trade	Claims
Boilermaker	3	Riveter	1	Caulker Riveter	3
Burner	1	Skilled Labour	47	Plumber	1
Coppersmith	1	SLA Worker	2	2nd Rate Engineer	1
Electrical Fitter	6	Welder	4	Shipwright Driller	1
Electrician	2	Technical Supervisor	1		
Engine Fitter	4	Shipwright	6		
Inspector of Shipwrights	1	Slinger	1		
Iron Caulker	2	Mason	1		
Joiner	3	Diagnostician	1		
Labourer	4	Fitters' Mate	3		
Lagger	4	Group Instructor	1		
Painter	4	Chargeman of Painters	1		
Recorder	1	Chargeman of Skilled Labourers	1		
Source: BA 27/318 <i>Compensation arrangements for employees who contracted asbestosis working in the Royal Dockyards</i> .					

Type of exposure	Group	Trade	No in sample
Continuous	1	Lagger, sprayer	13
		Mason, sailmaker-lagger, asbestos storeman	7
		Painter	22
Intermittent	2	Electrical fitter	201
		Riveter-caulker-driller, burner, welder	68
		Ship fitter	48
		Plumber-coppersmith	38
	3	Shipwright	172
Engine fitter		161	
Varied or insignificant	4	All other occupations, including semi-skilled and unskilled labourers	684
		Total in sample	1,414

Source: Sheers and Templeton 'Effects of Asbestos in Dockyard Workers' p575.

	Survey Population	Either X-Ray Responders	Either Questionnaire Responders	X-Ray and Questionnaire	Absolute Non-Responders
In Yard Males	6694	5205	4465	4004	1028
Outstation Males	0	0	0	0	0
Female Industrials	434	270	200	166	130
Total	7128	5475	4665	4170	1158

Source: Harries *et al* *Royal Naval Dockyards Asbestosis Research Project*, p36.

Radiographic Abnormality	Duration of Employment in Years							All Years
	<5	5-9	10-14	15-19	20-24	25-29	≥30	
Pleural Thickening	1.1	1.3	1.9	2.2	4.0	8.3	7.8	3.8
Pleural Calcification	0.2	0.3	0	0.1	0.8	1.7	4.3	1.3
Pulmonary Fibrosis (Suspected or Definite)	0.4	0.1	0	0.4	0.4	1.2	1.5	0.6
Pulmonary Tuberculosis	1.5	1.4	2.1	1.9	4.4	2.9	3.4	2.4
Other Conditions	6.6	6.1	5.5	5.9	9	7.7	10.3	7.5
None	90.2	90.9	90.5	89.5	81.3	78.1	72.8	84.5
Number of Men X-rayed	789	680	427	480	361	375	892	4004

Source: Harries *et al Royal Naval Dockyards Asbestosis Research Project*, p77.

Radiographic Abnormality	Duration of Exposure in Years							All Years
	<5	5-9	10-14	15-19	20-24	25-29	≥30	
Pleural Thickening	1.9	3.9	5.0	5.2	10.9	15.7	9.3	3.8
Pleural Calcification	0.5	1.3	1.5	3.1	1.0	2.2	7.3	1.3
Pulmonary Fibrosis (Suspected or Definite)	0.3	0.2	0.6	1.1	0.6	2.2	3.7	0.6
Pulmonary Tuberculosis	2.3	1.1	1.5	3.7	3.8	3.0	4.6	2.4
Other Conditions	7.5	7.2	3.3	6.1	11.2	6.7	11.9	7.5
None	87.4	86.3	88.2	80.8	72.4	70.1	63.2	84.5
Number of Men X-rayed	2548	439	271	229	156	134	227	4004

Source: Harries *et al Royal Naval Dockyards Asbestosis Research Project*, p89.

Table 5.7
Distribution of Responders to 'Free' or 'Controlled' Questionnaires by Age and Smoking Habits -
Chatham Dockyard

Age Group	Non-Smokers	Ex-Smokers	All Smokers	Pipe or Cigar Smokers	Cigarette Smokers (Gms per day)			
					1-4	5-14	15-24	≥25
<20	110	26	109	3	6	23	53	24
20-24	192	60	278	26	17	41	135	57
25-29	152	65	219	57	16	40	80	23
30-34	113	87	218	62	14	34	80	28
35-39	89	44	160	73	4	24	36	21
40-44	92	62	181	69	6	30	46	30
45-49	82	117	270	104	14	41	72	37
50-54	75	128	327	126	10	52	93	45
55-59	89	157	387	168	14	56	101	43
≥60	87	142	347	155	16	75	68	28
All Ages	1081	888	2496	843	117	416	764	336

Source: Harries *et al* *Royal Naval Dockyards Asbestosis Research Project*, p101.

Radiographic Abnormalities	Smoking Category	Age Groups										
		<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	≥60	All Years
Pleural Thickening	Non-smokers	0.6	0	0	1.9	0	1.7	4	2.9	9.1	2.2	1.8
	Ex-smokers	0	0	0	0.6	4.7	3.4	9.4	10.2	7.9	5.5	5.5
	Smokers	0	0	0	1.5	0.7	4.9	6.4	6.3	6.8	6.4	4
Pleural Calcification	Non-smokers	0	0	0	0	0	0	1.3	0.7	3.9	4.4	0.8
	Ex-smokers	0	0	0	0	1.2	2.5	1.3	3.8	5.4	2.1	2.2
	Smokers	0	0	0	0	0	0.9	1.2	2.4	2	2.5	1.2
Pulmonary Fibrosis (Suspected or Definite)	Non-smokers	0	0	0	0	0	0	0	1.4	0.7	0	0.2
	Ex-smokers	0	0	0	0	0	0	0	0	1.1	2.9	0.6
	Smokers	0	0	0	0	0.7	0	0.8	0.5	2.6	1.6	0.8
Pulmonary Tuberculosis	Non-smokers	0	0	0	2.4	2.4	5.1	3.3	1.4	3.3	1.5	1.7
	Ex-smokers	0	0	0	0	2.3	0.9	4.9	5.5	1.1	4.2	2.5
	Smokers	0	0.4	0.3	0	1	3.9	2.9	3.6	4.5	5.9	2.7
Other Conditions	Non-smokers	7.8	4.5	2.4	1.9	1.2	7.9	10	5.7	9.7	8.8	5.5
	Ex-smokers	0	1.8	3.5	4.8	0	6.8	8	3.8	6.5	10.9	5.8
	Smokers	9.8	4.9	3.3	6	8.7	7	7.6	10.1	13.2	13.8	8.9
None	Non-smokers	91.7	95.5	97.6	93.7	96.5	85.4	81.3	87.9	73.4	83.1	90.1
	Ex-smokers	100	98.3	96.6	94.6	91.9	86.4	76.3	76.7	78.1	74.4	83.4
	Smokers	90.2	94.7	96.4	92.5	89	83.3	81.2	77	70.9	69.7	82.4
Number of Men X-rayed	Non-smokers	90	166	145	103	85	89	75	70	77	68	968
	Ex-smokers	21	57	58	83	43	59	112	118	139	119	809
	Smokers	82	244	196	201	150	165	244	296	345	304	2227

Source: Harries *et al Royal Naval Dockyards Asbestosis Research Project*, p71

**Table 5.9
ARD Among Chatham Dockyard Workers by Trade**

Trade	Pleural Plaques	Asbestosis	Mesothelioma	Mesothelioma &Asbestosis	Lung Cancer	Other	Unknown ARD	Total
Bilge cleaner			1					1
Boilermaker			1			1		2
Bosun of the yard			1					1
Carpenter and joiner			1					1
Contractor			1					1
Electrical engineer		1						1
Electrical fitter			2					2
Engine fitter then recorder	1							1
Fitter ⁶⁰⁶	2							2
Insulator		1		1				2
Iron caulker	1							1
Joiner			1					1
Labourer			2		1			3
Lagger		2						2
Leading caisson hand			1					1
Machinist			2					2
Oxy acetylene burner					1			1
Paint sprayer			1					1
Painter			1					1
Shipwright then recorder		1						1
Rigger			1					1
Shipwright	3	1	4	1			1	10
Shipwright driller			2					2
Shot blast supervisor			1					1
Shunter's assistant		1						1
Skilled labourer		1		1				2

⁶⁰⁶ Fitter could refer to engine, electrical, ship or armament fitting.

Storeman			1					1
Welder		1	1					2
Wife of shipwright			1					1
Unknown	1	2	4					7
Total	8	11	30	3	2	1	1	56

Compiled from various sources including: interviews (Gifford and Jenkins); asbestos related disease questionnaires (ARD1 and ARD8); initial questionnaires (24, 77, 140 and 150); RDL Apprentice Record Cards; legal case reports (Patterson v Ministry of Defence; Phillips v Ministry of Defence and Pacey v Ministry of Defence); TNA BA 27/318; Medway Coroner's Inquest Hearing 12 May 2011; Medway Coroner's Court report 2011/G/01189; personal injury lawyers websites: www.mayowynnebaxter.co.uk; www.clmlaw.co.uk; www.prosheffield.co.uk; www.asbestosvictimadvice.com; www.ts-p.co.uk; www.personalinjury.ffw.com; www.industrialdiseaselawyers.co.uk accessed between January and December 2012); newspapers (*Evening Post* 18 October 1990, p6; *Medway Messenger* 4 November 2005, p43; 18 November 2005, p45; 9 October 2006, p2; 20 April 2007, p4; 11 February 2011, p34; *Medway News* 10 March 2006, p29; *Medway Standard* 5 27 May 1997, p14; December 2000, p2; *Medway Today* 5 May 2000, p13; 14 April 2000, p1; *The Telegraph* 18 April 2002); news websites (www.blogsmirror.co.uk/asbestos-campaign; www.kentonline.co.uk accessed between January and December 2012).

Table 5.10				
Working precautions as published in Working With Asbestos 1970				
Type of Work	Notices to be displayed	Protection		
		Registered Asbestos Worker	Neighbourhood Worker	Management Visitor
Sprayed limpet asbestos	SPRAYED LIMPET ASBESTOS WORK ENTRY PROHIBITED	Fully protected with impervious suit, gloves, boots. Issued 'underclothing'. Air-fed hood. Shower at end of forenoon and afternoon.	Not allowed entry (if vital, as for registered asbestos worker).	Visit to be of less than half hour (if longer, as for registered asbestos worker). Impervious suit, gloves, boots, skull-cap. Approved respirator.
Major de-lagging	ASBESTOS DE-LAGGING NO ENTRY	Fully protected with nylon overall, gloves, boots, skull-cap. Issue 'underclothing'. Air-fed hood or approved respirator. Shower on completion of day or night shift.	As for sprayed limpet asbestos.	Visit to be of less than half hour (if longer, as for registered asbestos worker). Nylon overall, skull-cap. Approved respirator.
Major lagging/cutting of asbestos materials	ASBESTOS LAGGING NO ENTRY	As for major de-lagging.	As for sprayed limpet asbestos.	As for major de-lagging.
Minor lagging/de-lagging	ASBESTOS WORK IN PROGRESS	Nylon overall, skull-cap. Issued 'underclothing'. Approved respirator. Shower on completion of day or night shift.	No restrictions on entry. Respirators available on loan.	No restrictions on entry. Respirators available on loan.
Lagging shop (covered by own regulations)	ASBESTOS SHOP NO UNAUTHORIZED ENTRY	As for minor lagging/de-lagging.	Respirators available on loan.	No restrictions on entry. Respirators available on loan.
Asbestos stores	ASBESTOS STORE NO UNAUTHORIZED ENTRY	As for minor lagging/de-lagging.	Respirators available on loan.	No restrictions on entry. Respirators available on loan.

Source: MoD *Working with Asbestos*, pp 8-9

Table 5.11 Progress in introducing substitutes for asbestos-containing materials specified by the Navy Department		
Application	Asbestos Material	Progress in Introduction of Substitute Materials
Thermal insulation in machinery spaces	Calcium-silicate sections and plastic	Now supplied asbestos-free and recognizable by its yellow or pink colour. All calcium-silicate should be cut off ship so far as is practicable. (<i>Note</i> – Calcium-silicate containing up to 14% asbestos is coloured white.)
	Amosite-asbestos sections and plastic	No longer used, replaced by calcium-silicate. A large number of existing ships are insulated with Amosite; de-lagging operations will involve the full implementation of D.C.I. ⁶⁰⁷ 510/69.
	Self-setting finishing cement for high-temperature insulation – BD2 cement	An asbestos-free substitute is now specified.
	New-tempheit	Deleted from specifications. Replaced by calcium-silicate.
	Asbestos cloth	Glass cloth is now specified. Dust emitted from this cloth is an irritant but not a health hazard. Work is continuing to make this cloth less objectionable to handle.
	Asbestos rope and twine	Deleted from specifications. Glass is now specified.
	Asbestos mattresses	Mattresses of rocksil fibre covered with glass-cloth are now approved and in supply.
Local protection against fire	Asbestos millboard (very little used)	Deleted from specifications
	Asbestos cloth (more frequently used)	Dust-suppressed cloth is now specified. No prospect seen of finding a substitute fire-resistant

⁶⁰⁷ Defence Council Instruction.

		material. Main applications are hangar fire-curtains, curtains in magazines, and protection in way of welding and burning operations. Magazines will be separately compartmented in new construction and at long refits of existing ships. Glass-cloth is not acceptable for these usages.
Fire protection in magazines where jet efflux presents a potential hazard	Durestos (resin-bonded asbestos fibre)	No substitute material suitable for this purpose. Material is supplied by manufacturer to exact sizes required. There is therefore no health hazard in shipyard application.
Thermal insulation of hull structure	Sprayed limpet asbestos and Blue-block asbestos or Amosite board	Deleted from specifications. Mineral fibre marine board, which is asbestos-free, is now specified. Any ships still insulated with sprayed limpet asbestos will require full implementation of D.C.I. 510/69 for de-lagging operations.
	Asbestos fibre and cloth for pipe covering	Deleted from specifications. Replaced by polyurethane or mineral fibre preformed sections with canvas covering, which are all asbestos-free.
Acoustic insulation of hull structure	Paxtiles, Paxfelt, Paxmarine	Deleted from specifications. Existing stocks are being kept for small repairs only. Replaced by mineral fibre resin bonded slab, which is asbestos-free.
	Amosite asbestos	Deleted from specifications. Replaced by mineral fibre marine board.
	Limpet asbestos board	Deleted from specifications. Replaced by perforated PVC sheet (Darvic).
High-temperature jointing and packing materials	Asbestos fibre and compressed asbestos fibre	No substitute heat-resistant material. No health hazard in forms used in shipyard applications.
Bearing materials, brake	Asbestos reinforced plastics	No substitute wear-resistant material. No health hazard

linings		except if those materials are ground or worked (no known requirement for this).
Bathroom and galley deck-coverings	Neoprene terrazzo	Asbestos-free neoprene terrazzo now available. Dockyards and overseers have been informed that this is the only acceptable material.
Partition bulkheads	Compressed asbestos sandwiched between metal, plywood, plastic sheets, etc., e.g. Marinite, Solastos.	Deleted from specifications, which now state that materials containing asbestos are not to be used. Steel, aluminium or plywood will generally be used, pending investigations into alternative asbestos-free materials.
Covers to bunk, settee and seat-locker cushions and mattresses for submarines	Asbestos cloth (untreated, i.e. not dust-suppressed)	Deleted from specifications. Fire-retardant foam mattresses now approved.
Source: MoD <i>Working with Asbestos</i> , pp 14-16.		

Chapter 6

‘You’re Safer in Nuclear’.⁶⁰⁸

Nuclear power has given submarines an entirely new dimension – something they have always wanted – the ability not to come to the surface for air. The Royal Navy is extremely proud of its nuclear fleet submarines, they are the capital ships of the future, and it will not be lost on those present that Chatham is really well in on the support of the navy in years to come. It was an obvious choice to put these facilities on the Medway.

Admiral Sir Horace Law at the opening of Chatham Dockyard’s Nuclear Complex in June 1968⁶⁰⁹

The advent of nuclear propulsion in submarines marked an important change in British defence strategy. It was also an important era of Chatham Dockyard’s history. The initial decisions regarding the construction of hunter-killer submarines (SSNs) and Polaris submarines (SSBNs) signalled the end of the Dockyard’s reign as the Navy’s submarine building specialist.⁶¹⁰ Later, hope for the future of the Dockyard was regained through its selection as the UK’s second refitting and refuelling site for SSNs.

While positive news in terms of workers’ livelihoods, this new role increased the health risks of ionizing radiation within the working environment significantly. Radiation is invisible to the human eye and while a very large dose can have immediate effects on the health, the smaller and longer term exposures that some Dockyard workers received had latent effects. Like asbestosis and mesothelioma sufferers, former workers who were otherwise strong and healthy have been diagnosed with life-threatening malignant diseases years after ceasing to work at the Dockyard. Unlike asbestos-related disease (ARD) sufferers, the men dying from radiation-induced cancer (RIC) were relatively young, many in their thirties. Concern over the incidence of these cancers resulted in the foundation of the Campaign for Chatham Dockyard Radiation Workers (CCDRW) in 1998. The National Register of Radiation Workers (NRRW) found that some 673 civilian nuclear workers

⁶⁰⁸ *Periscope* January 1977, p2.

⁶⁰⁹ P. MacDougall *The Chatham Dockyard Story* (Kent: Rochester press, 1981), pp158-9.

⁶¹⁰ See E. Haxhaj ‘More Bang for a Bob’ for more detail. NB SSN is the classification used for a nuclear-powered general attack submarine whereas SSBN is used for nuclear-powered submarines equipped to launch ballistic missiles.

employed by the MoD had died from cancer between 1961 and 2009 and another 774 deaths were predicted (see table 6.4).⁶¹¹ While these figures may be much smaller than for the asbestos hazard, they still represent significant loss of life. Indeed, using the National Radiological Protection Board's (NRPB) risk rates in the late 1980s, Dr Barrie Lambert, then working for the Radiation Biology Department at St Bartholomew's Hospital Medical College, demonstrated that radiation workers were at greater risk than asbestos workers, even at the rate of 15 milliSieverts (mSv) per annum, which is much lower than the 50 mSv per annum maximum permissible dose (MPD) that applied during the period of this study.⁶¹² This chapter considers the management of the radiation risk alongside the behaviour of workers engaged on nuclear work. It presents examples of radiation-induced illnesses and incidents that resulted in unnecessary dose levels being received by workers, in contravention of the ALARA/ALARP principles (defined below). As with the asbestos chapter, it looks at the precautions that the MoD put in place to protect workers and asks whether they were sufficient.

Primary information concerning the radiation hazard is less profuse than that for the asbestos risk. In the period under consideration, the MoD was not so energetic in researching the effects of radiation on its workers, instead relying predominantly on existing legislation and practice in the nuclear power industry to shape its worker protection.⁶¹³ This is highlighted by the fact that the MoD was so proactive in relation to asbestos risk. The official stand point is that legislation was already in place with regard to ionising radiation, but this was also the case with asbestos and in both cases the protection offered by legislation has since been found wanting. The evidence available was incomplete, but suggests that other priorities for the MoD, such as the defence of the nation, submarine building and maintenance schedules and of course weapons programmes precluded the same sort of dynamic action against the risk to workers from radiation. The Defence Committee's *Twelfth Report: Radiological Protection of Service and Civilian*

⁶¹¹ C.R. Muirhead *et al Third Analysis of the National Registry for Radiation Workers: Occupational Exposure to Ionising Radiation in Relation to Mortality and Cancer Incidence* (Oxfordshire: Health Protection Agency, 2009), p144.

⁶¹² B. Lambert *How Safe is Safe? Radiation Controversies Explained* (London: Unwin Hyman, 1990), p252. For the period under consideration, radiation doses received from exposure to ionising radiation were (and still are) measured in Sieverts (Sv). A Sievert is a high level of exposure and most exposures ran to milliSieverts. Man-Sieverts were used to refer to the collective dose to the workforce or a group of workers.

⁶¹³ Workers from Rosyth participated in a study by the Medical Research Council between 1968 and 1979, the results of which are discussed later.

Personnel acknowledged that MoD policy in terms of radiation protection was ‘essentially reactive’, though it should be noted that the MoD voluntarily adopted a lower MPD of 30 mSv in 1989 ahead of International Commission on Radiological Protection (ICRP) and NRPB recommendations, as did much of the civil nuclear power industry.⁶¹⁴ The few relevant files available at TNA have been reviewed and the FOI mechanism has been used to try and access potentially useful information restricted by closure periods. One such request resulted in the early opening of parts of DEFE 19/224 – *Incidents or accidents involving MOD nuclear materials or nuclear facilities*. Only one of the incidents recorded therein relates to the Dockyards, namely the loss/theft of a radioactive source from Rosyth Dockyard in 1981, which was widely publicised in contemporary press articles. Apart from providing examples of lax supervision and security, this incident had little relevance to the study. Newspaper articles have been used, including issues of *Periscope*, which were helpful in terms of understanding attitudes to radiation and the pressure put on workers to complete refits on time. The BBC Panorama documentary, *The Price of Peace*, which aired on 26 January 1998, has also been considered.

Life history sources have been particularly helpful in terms of understanding the work and conditions in the Nuclear Complex. There is, however, much more reticence to sharing information about nuclear work. An overriding secrecy still surrounds much material dealing with nuclear radiation and more former workers have either refused to complete questionnaires or requested that their responses remain anonymous than for any other subject covered during the study. All Dockyard workers were asked to sign the Official Secrets Act 1939 (OSA), but it is more often brought up when workers are asked about anything relating to nuclear submarine refitting. This caution was also encountered in communication with the CDRW. The campaign’s researcher, Thomas (Oscar) Foreman, was very helpful in answering specific questions, but was unwilling to allow access to copies of the MoD incident reports for Chatham Dockyard for fear of breaching OSA (he signed as an employee of the Dockyard) and Data Protection Legislation. Indeed, these incident reports have proven particularly elusive. Their release by the MoD was the result of a request, by Jonathan Shaw MP, that Secretary of State for Defence, John Spellar:

⁶¹⁴ Defence Committee *Twelfth Report: Radiological Protection of Service and Civilian Personnel* (London: HMSO, 1990), pviii.

... place in the [House of Commons] Library a complete set of unplanned incidents and accidents involving individuals of the civilian work force at Chatham dockyard which resulted, or may have resulted, in radiation exposure to one or more individuals.⁶¹⁵

At the time, Spellar responded that he was waiting for an official response regarding the 'practicality of providing such a report'. Redacted copies of incident reports relating to Chatham were certainly released by the MoD in the late 1990s. According to John Connor, the MoD's chief safety officer c1998, they should have been deposited in the House of Commons Library and thereby released into the public domain.⁶¹⁶ This does not appear to have happened and the only copies I have been able to locate are those held by the CCDRW. Their existence was learned of too late for a concerted effort to obtain access to be launched for this study, which is unfortunate as from the introduction that the CCDRW wrote to accompany them and Foreman's answers to my questions, I believe they could be a very useful source for evaluating safety measures, worker culture and management attitudes/decisions.

There are few historical analyses of the safety aspects of radiation work, either in the civil nuclear power industry or government installations in the UK. No historical works were found concerning the radiation hazard in the Dockyards or RIC among their workers. Sources concerning the history of civil nuclear establishments were of some help in understanding the development of the nuclear industry, health and safety in nuclear fields and the consequences when things go wrong. Lorna Arnold's acclaimed official history of the Windscale accident in 1957 has provided some background.⁶¹⁷ Mike O'Riordan's history of the NRPB has provided some insight into the development of radiation protection.⁶¹⁸ Claudia Clark's account of female dial painters and their struggle for compensation in the United States, provides detailed background in terms of the discovery, use and impact of radioactive materials.⁶¹⁹ One of the most useful texts has been Dr Barrie Lambert's very detailed discussion on radiation controversies, which looks at official

⁶¹⁵ Hansard (Commons) *Chatham Dockyard* 28 November 1997 v301, c694W.

⁶¹⁶ J. Connor *Radiation Protection in Naval Dockyards* (paper presented to Members of House of Commons circa 1998), p9.

⁶¹⁷ Arnold *Windscale 1957*.

⁶¹⁸ M. O'Riordan *Radiation Protection: A Memoir of the National Radiological Protection Board* (Oxfordshire: Health Protection Agency, 2007).

⁶¹⁹ Clark *Radium Girls*.

responses to the risks and also at the variety of science behind risk estimation and dose limitation.⁶²⁰ It contains a short history of the realisation of risk and of radiation protection, including dose limitation. Marjorie C. Malley's book has been helpful in terms of background to radioactivity; it successfully achieves its aim to provide an overview of the history of radioactivity for interested non-specialists.⁶²¹ Reference has also been made to the chronicles of the discovery and exploitation of radiation by American journalist, Catherine Caulfield.⁶²² Its focus is largely on environmental and medical exposures rather than occupational, although it does provide a detailed early history of the discovery of radiation, its early uses and the fate of early scientists, radiologists and the radium dial painters.

Published primary sources used included medical journals and the text book *An Introduction to Radiation Protection*.⁶²³ The latter enabled me to understand the current thinking that informed training for Dockyard workers and the protection afforded to them. Much of the thinking remains the same, save for the dose limits considered acceptable for workers (discussed in greater detail later).

The World Set Free?⁶²⁴

The effects of radiation are generally defined as either hereditary (i.e. affecting reproductive cells and thence future generations) or somatic. This study focused on the somatic effects. These occur because radioactive particles have interacted with the skin (external contamination) or have entered the body through inhalation, ingestion or open wounds (internal contamination). Such contamination can result in molecular changes in the body, cell death and cell mutations. The importance of monitoring both internal and external radiation was highlighted in the case of Bill Neilson, an industrial radiographer who worked for a company called Metal and Pipeline Endurance Ltd (i.e. not for Chatham Dockyard), who died in 1992 of bronchopneumonia, radiation-induced myeloid leukaemia,

⁶²⁰ Lambert *How Safe is Safe?*

⁶²¹ Marjorie C. Malley *Radioactivity: A History of a Mysterious Science* (Oxford: OUP, 2011).

⁶²² Caulfield *Multiple Exposures*.

⁶²³ A. Martin and S. A. Harbison *An introduction to Radiation Protection* Second Edition (London: Chapman and Hall Ltd., 1979).

⁶²⁴ From the title of H. G. Wells' prophetic novel, written in 1914 and which foretold of the development of atomic weapons.

radiation dermatitis and radiation-induced myelodysplasia.⁶²⁵ His records, taken from film badges that monitored the dosage on the outside of his body, showed a lifetime dose of just 108 millisieverts; the post mortem after his death showed that he had inhaled and/or ingested radioactive particles during his work and that he had actually received an accumulative dose of nearly 15,000 millisieverts.⁶²⁶ Like Neilson's employer, the Dockyards did not routinely check internal radiation dose in their workers, but issued them with film badges and other externally worn monitoring devices. The main long term risk from exposure to radiation is cancer. Radiation can cause this cell damage, but it should be noted that cancers caused by radiation are not identifiable from cancers caused by other factors. Like with asbestos-related lung cancer, occupational exposure is considered alongside other factors to determine whether radiation is the likely cause.

Human beings have always been exposed to a degree of natural background radiation, from cosmic and terrestrial sources, plus the body also contains small quantities of the radioactive isotopes carbon-14 and potassium-40.⁶²⁷ Indeed, some scientists argue that our evolution is the result of this radiation.⁶²⁸ Background radiation is not harmless. Indeed, much like with asbestos, it does not take a large amount of radiation to cause cellular mutations that can result in birth defects or cancer. Skin cancer from radiation caused by the sun is one common example. The probability of mutation is, however, increased when the number of radioactive particles we are exposed to increases. Our exploitation of and manufacture of ionizing radiation has increased our exposure exponentially (see table 6.3).⁶²⁹ Moreover, while background radiation is predominantly an external risk, there is greater risk of internal radiation from man-made sources.

The discovery of radiation stretches back to the mid-nineteenth century and Henri Becquerel's realization that some elements are naturally radioactive. In 1895 Wilhelm Roentgen submitted his paper 'On a New Kind of Ray' to the Würzburg Physical-Medical

⁶²⁵ *Hansard (Commons) Debates: Health and Safety, 10 May 1994 v243 cc201-24.*

⁶²⁶ BBC Panorama *The Price of Peace.*

⁶²⁷ For more on natural background radiation, see: Lambert *How Safe is Safe?* pp144-161 and Caulfield *Multiple Exposures*, pp193-9.

⁶²⁸ Malley *Radioactivity*, pp199-200.

⁶²⁹ A. Martin and S. A. Harbison *An introduction to Radiation Protection* Second Edition (London: Chapman and Hall Ltd., 1979), pp 53 & 57.

Society, announcing his discovery of the X-ray. Radium was discovered in 1898 and like asbestos it was viewed as a wondrous material:

Though only discovered in 1898, the new metal, radium, bids fair to set the physical-chemical world agog. The prospect of securing energy for nothing has stimulated the imagination of a certain number of human beings from time immemorial, but the nearest approach to the mythical “perpetual motion” thus far made would seem to be that presented by radium and its salts.⁶³⁰

Some risk in the use of radium was, however, apparent. In the same article, it was noted that ‘a small quantity of it, carried in a bottle in the waistcoat pocket, burned holes into the flesh in six hours; the superficial necrosis⁶³¹ produced resulted in sores that required several weeks to heal’.⁶³² Indeed, in 1896, in an attempt to disprove recent findings of afflictions caused by X-rays, Elihu Thompson, a physicist employed by the General Electric Company, subjected the joint of his left little finger to prolonged contact with X-rays. No immediate damage was discernible, but during the following weeks, his finger became red and enflamed. He later reported that ‘the whole epidermis is off the back of the finger and off the sides of it also, while the tissue, even under the nail, is whitened and probably dead, ready to be cast off ... The wound itself is very peculiar and I never saw anything like it. It continued to develop and spread over the extent of the surface for three weeks and I am not sure the affection has reached its limit’.⁶³³ Subsequently, a variety of methods of protection against X-ray burns began to appear and had some effect on minimising such injuries. Thomas Alva Edison also took up experimentation with X-rays. Unfortunately, his assistant Clarence Dally paid the price. In 1896, Edison recorded that, while trying to make an X-ray powered light bulb, he ‘soon found that the X-ray had affected poisonously my assistant, Mr Dally, so that his hair came out and his flesh commenced to ulcerate’. Dally tried various remedies for his ulcers and underwent grafts of skin from his legs to his damaged hands; nothing was successful. His burns turned cancerous and when further X-ray exposure performed by his doctor to try and undo the damage proved fruitless, he

⁶³⁰ ‘Remarkable Properties of Radium, May 9, 1903’ reprinted in *Journal of the American Medical Association* 289:18 (2003), p2436.

⁶³¹ Necrosis is a form of cell injury that causes the premature death of cells in living tissue.

⁶³² ‘Remarkable Properties of Radium, May 9, 1903’

⁶³³ Caulfield *Multiple Exposures*, p11.

resorted to amputation. In 1904, at the age of 39, Dally died from his exposure to radiation.⁶³⁴ In the following ten years Ernest Rutherford with Frederick Soddy and Marie Skłodowska-Curie with her husband Pierre Curie found that certain nuclei are unstable and that they emit radiations of three main types: alpha, beta and gamma radiation.⁶³⁵ The Curies were, of course, credited with discovering that radiation can reduce and cure tumours; they also coined the term 'radioactivity'. Marie Curie was also credited with the erroneous hypothesis that radium selectively destroyed diseased cells and promoted the growth of healthy ones.⁶³⁶ Indeed, she and her daughter Irène even drove around the French battlefields during the First World War, carrying X-ray stations to the front line.⁶³⁷

Radiation can be divided further into non-ionizing radiation and ionizing radiation. Non-ionizing radiation includes visible light, ultra-violet light, infra-red radiation and electromagnetic fields. Sources of electromagnetic fields are used extensively in telecommunications and manufacturing. Ultra-violet light occurs in natural sunlight and also forms part of some man-made light sources. Ionizing radiation, which is the concern of this chapter, includes X-rays, gamma rays, radiation from radioactive sources and sources of naturally occurring radiation, such as radon gas. Ionising radiation is used in the energy industry, in the medical profession both diagnostically and curatively and by the military.

The use of radioactive materials during the First World War and into the 1930s included many so-called restorative cures. Dr William J A Bailey developed radium salts, which he gave the trade name Radithor. Industrialist Eben Byers was among its victims, dying in 1934 from ingesting large quantities of the solution between 1927 and 1930. Toothpastes, such as Doramed Radioactive Toothpaste, promised to whiten teeth and radium was rubbed into the scalp to promote hair growth. X-rays were used in epilation, with cases of X-ray burns, cancers and death resulting from the US Tricho Institute's treatments were predicted to have run into the thousands.⁶³⁸ The *American X-Ray Journal* claimed that there were about 100 diseases that X-rays could treat. Examples included

⁶³⁴ Caulfield *Multiple Exposures*, pp9&13.

⁶³⁵ A. Martin and S. A. Harbison *An introduction to Radiation Protection, Second Edition* (London: Chapman and Hall, 1979), p9.

⁶³⁶ Clark *Radium Girls*, p43.

⁶³⁷ Malley *Radioactivity*, p125.

⁶³⁸ Caulfield *Multiple Exposures*, p16.

treatments for birthmarks, ringworm, acne and women's problems (i.e. X-rays were used to treat excessive bleeding during menstruation and to induce menopause). Some women had their ovaries irradiated as a cure for depression.⁶³⁹ The victims inadvertently contributed to our knowledge of the biological effects of radiation. Clark explores the attitudes towards radium and X-rays prior to 1930, explaining that 'radioactive substances were hailed as therapeutic agents'.⁶⁴⁰ Her chapter on radium, research and business provides further disturbing evidence of the use of these harmful materials supposedly to promote health and address cosmetic issues.⁶⁴¹

James Chadwick's identification of the neutron in 1932, followed seven years later by the discovery of nuclear fission, by Lise Meitner, Otto Hahn and Fritz Strassmann, began a new era that saw the creation of new weapons and the promise of unlimited energy sources. The Atomic Age, marked socially by the appearance of the atom in literature, popular culture, art and even home decoration, was also an era of public fear of the unknown. In 1956, radioactive debris from a US hydrogen bomb test hit the Japanese fishing vessel *Fukuryu Maru*, killing one crew member outright and causing radiation sickness in the rest of the men on the boat. The word 'fallout' became publicly associated with nuclear weapons and their testing; public fear and suspicion followed, as did the pro-nuclear propaganda.⁶⁴² One of the most famous examples was Walt Disney Productions' 1957 film, *Our Friend the Atom*, which was shown in US schools. Perhaps less obvious examples were the 'independent' reports in 1956 of studies of the effects of radiation conducted by the US National Academy of Sciences (NAS) (the first Biological Effects of Atomic Radiation (BEAR) report) and the British MRC. Hamblin asserts that the BEAR report 'was a product of delicate negotiation across institutional, disciplinary, and even national lines' and that the NAS had made extensive use of Atomic Energy Commission (AEC) data and personnel, who sat on various committees. He also refutes the argument that the release of the MRC's report, which was published on the same day and reached very similar conclusions, was coincidental: 'The NAS and the MRC made personal contacts, traded drafts, and coordinated release dates to ensure conformity and to maximize

⁶³⁹ Caulfield *Multiple Exposures*, p16.

⁶⁴⁰ Clark *Radium Girls*, p39.

⁶⁴¹ Clark *Radium Girls*, pp39-64.

⁶⁴² J. D. Hamblin 'A Dispassionate and Objective Effort: Negotiating the First Study on the Biological Effects of Atomic Radiation' *Journal of the History of Biology* 40 (2007), p147.

the effect of their reports'.⁶⁴³ Caulfield also identified that there were close links between ICRP, MRC, the BEAR committee and the US National Commission on Radiological Protection (NCRP).⁶⁴⁴ The assertion that there existed a limit below which exposure to radiation was safe or acceptable, however, ensured that the burgeoning nuclear industry (and the Dockyards) had the workers they needed.

As with the asbestos regulations, industry interfered with the setting of dose limits. For example, in 1956 the BEAR committee recognised that 50 mSv MPD per year was too high and considered recommending that the occupational MPD be reduced to less than 30 mSv. After surveying AEC plant managers, however, the committee was convinced that anything under 50 mSv would be impracticable for the nuclear industry.⁶⁴⁵ Given the subsequent reduction in MPD to below 30 mSv in recent years, nuclear industry workers (including Dockyard workers) were again put at higher risk for economic reasons.

1956 also saw the opening of the world's first full-sized nuclear power plant, at Windscale, Cumbria.⁶⁴⁶ A year later a fire in one of the nuclear piles there brought nuclear safety into public consciousness.⁶⁴⁷ The effects of the consequent radiation release were felt as far away as Spain, where fallout had agricultural consequences. It released more than 20,000 curies of radioactivity and resulted in the slaughter of local cattle and a Government ban on the selling and consumption of milk produced in an area of 200-square-miles radiating from the accident. The NRPB estimated that by 1997 the accident would be accountable for 33 deaths and 260 cases of thyroid cancer.⁶⁴⁸ Revelations of high levels of radiocaesium in the soil and in sheep in the late 1980s was blamed on fallout from the Chernobyl nuclear accident in 1986. Local farmers were convinced, however, that the fire at Windscale (by this time renamed Sellafield) and subsequent pollution from the site contributed to the contamination, which threatened their livelihoods.⁶⁴⁹ As well as impacting on future reactor design, the accident drew attention to safety issues for nuclear workers. A shortage of skilled workers was one issue. As will be shown later, at Chatham

⁶⁴³ Hamblin 'A Dispassionate and Objective Effort', p149.

⁶⁴⁴ Caulfield *Multiple Exposures*, p136.

⁶⁴⁵ Caulfield *Multiple Exposures*, p136.

⁶⁴⁶ The world's first nuclear power station was inaugurated in the USSR in 1954.

⁶⁴⁷ For more on the causation of the Windscale accident, see Arnold *Windscale 1957*.

⁶⁴⁸ Caulfield *Multiple Exposures*, pp150-1.

⁶⁴⁹ Wynne 'May the Sheep Safely Graze?', p62.

Dockyard, staff shortages in a climate of strict deadlines meant health and safety may have been circumvented.

In March 1979, the reactor at Three Mile Island power station, Harrisburg, Pennsylvania, came close to core meltdown.⁶⁵⁰ 15 curies of radioactive iodine was estimated to have been released, resulting in an average dose of about one millirem to local inhabitants. By this time, Chatham Dockyard's refitting programme was well underway and an article in *Periscope* demonstrated the Dockyard's effort to reassure workers that the same could not happen at Chatham.⁶⁵¹ Four years earlier a worker at the Browns Ferry plant, Alabama, was testing for air leaks using a candle flame and accidentally started a fire that quickly spread from the cable spreading room into the reactor building. The fire burned out of control for seven and half hours, destroying over 1600 electrical cables including 628 safety related cable systems.⁶⁵²

The use of nuclear radiation expanded far beyond its medical origins and today permeates almost every area of our lives. Caulfield provides the following examples:

... radiation today has hundreds of practical applications. Plant breeders irradiate seeds to create mutant strains of crops. Researchers use radioisotopes to track the movements of fertilizers and pesticides through plants and soils, and to study the global movement patterns of wind and water. Manufacturers use radioisotope gauges to check that beer cans are properly filled and cigarettes are tightly rolled. Doctors use radiation in diagnosis and therapy and to sterilize medical products. Investigators detect forgeries and date natural and man-made objects by measuring radioactive decay. Inventors use radiation to induce chemical reactions that give rise to new products, such as Teflon-coated frying pans and super-absorbent disposable diapers. Radioactive materials also go into the making of smoke detectors, self-illuminating watches and instrument panel dials, lightning rods, gas camping lanterns, cellophane dispensers, false teeth, and other consumer products.⁶⁵³

As its use increased, so methods of protection and reduction in exposure improved (examples of reductions in exposure provided by better shielding and chemical processes in the reactors, which reduced the build-up of radioactive CRUD are detailed later). A

⁶⁵⁰ For more on the Three Mile Island accident, see Arnold *Windscale 1957*, pp144-7 and Caulfield *Multiple Exposures*, p240.

⁶⁵¹ *Periscope* August 1979, pp6-7.

⁶⁵² Nuclear Information and Resource Service *Safety Deficiencies at Browns Ferry Nuclear Power Complex* <http://www.nirs.org/factsheets/brownsferryfactsheet.pdf> (US, 2007).

⁶⁵³ Caulfield *Multiple Exposures*, p200.

number of bodies have been established in connection with radiation protection. The ICRP was established by the second International Congress of Radiology in 1928 and has been responsible for recommending MPDs since that date. In 1950 its scope was expanded to cover issues raised by nuclear power. The MPD was equivalent to 150 mSv per annum at that time, but has been reduced since then (see table 6.7). The membership of the ICRP was drawn predominantly from governmental nuclear institutions and medical radiology, earning it a reputation among pressure groups as being a ‘self elected elitist society’; Lambert suggests that the appointment of scientific representations from labour unions may have helped to address this.⁶⁵⁴ It was certainly criticised by the General, Municipal, Boilermakers and Allied Trades Union (GMB):

Since 1981 we have criticized the narrow representation on the ... ICRP, the self-appointed group of experts which recommends radiation exposure limits for countries to adopt, and have questioned the acceptability of their limits.⁶⁵⁵

In 1953, the Radiological Protection Service (RPS) was set up by the MRC and Ministry of Health (MoH), in order to provide advice and services to protect workers and the general public against radiation hazards; it did not, however, deal with atomic energy industry employees.⁶⁵⁶ Following the Windscale accident, leading industrialist Alexander Fleck advised that deficiencies in the health and safety organisation within the UKAEA needed to be addressed.⁶⁵⁷ In 1960 a committee chaired by Douglas Veale, Oxford University administrator and former civil servant, proposed the establishment of a national radiological advisory service in the UK. It was not until 1969 that the Radiological Protection Advisory Group was established, in anticipation of the Radiological Protection Bill being enacted. In 1970 the NRPB was formed by the Radiological Protection Act (Commencement) Order 1970. Its role was to conduct research on radiological protection and provide advice and information on the subject to Government Departments and others. In 1971 it became responsible for the RPS and the Radiological Protection Division of the Health and Safety Branch.

⁶⁵⁴ Lambert *How Safe is Safe?*, p55.

⁶⁵⁵ D. Gee ‘Occupational Exposures and the Case for Reducing Dose Limits’ in R. Russell-Jones and R. Southwood (eds) *Radiation and Health: The Biological Effects of Low-Level Exposure to Ionizing Radiation* (Chichester: John Wiley & Sons, 1987), p107.

⁶⁵⁶ O’Riordan *Radiation Protection*, p2.

⁶⁵⁷ O’Riordan *Radiation Protection*, p1.

In 1977 the ICRP published recommendations that introduced the As Low As Reasonably Achievable (ALARA) principle in terms of radiation dose limits. This essentially established that reasonable efforts should be made to reduce exposure levels below the MPD, bearing in mind the justification (i.e. that the benefit to society must outweigh the risk to the individual) and the cost of the reduction in dose. ALARA marked a change in approach by the ICRP; its focus changed from permissibility to limitation.⁶⁵⁸ The recommendations, were, at the same time, termed a ‘watershed in the history of radiation protection’ and criticised as being ‘so vague as to be practically unenforceable’. The GMB was among their critics:

Although employers are under a duty to reduce exposures as far below the maximum permitted limits as is reasonably achievable (‘ALARA’), this is very difficult to achieve, or enforce, in practice, without other numbers for the engineers and health physics people to aim for, such as the one-tenth or three tenths of the limit used in radiological protection. Our experience of radiation, and other harmful agents which are governed by the duty ‘as low as is reasonably practicable’, is that lower limits are the most effective way of achieving reductions in exposure.’⁶⁵⁹

In 1983, however, British Nuclear Fuels Limited (BNFL) was prosecuted because of the release of radioactive materials into the Irish Sea and found in contravention of the ALARA principle.⁶⁶⁰

In the UK the As Low As Reasonably Practicable (ALARP) principle is applied to radiation protection. It was enshrined in English case law in 1949 after the case of colliery worker Joseph Edwards, who died when a colliery road collapsed.⁶⁶¹ It is also the basis by which many Health and Safety Executive (HSE) judgements are made. In its application for radiation protection, it is based on the hypothesis that any amount of radiation exposure, no matter how small, can increase the chance of negative biological effects such as cancer and that the probability of the occurrence of negative effects of radiation exposure increases with cumulative lifetime dose; this is known as the linear no-threshold (LNT) model.⁶⁶²

⁶⁵⁸ O’Riordan *Radiation Protection*, p41.

⁶⁵⁹ Gee ‘Occupational Exposures and the Case for Reducing Dose Limits’, p112.

⁶⁶⁰ Lambert *How Safe is Safe?*, p59-60.

⁶⁶¹ *Edwards v National Coal Board*, Court of Appeal, 21 March 1949.

⁶⁶² The LNT model has its roots in genetic science in the 1920/30s and was accepted into the first BEAR report in 1956. It became associated with somatic effects from the late 1970s. There are various articles

Benefits to society, by radiology for example, and economic cost are also taken into consideration when judgements are made based on the ALARP principle. The incidents described later in this chapter were in direct conflict with the ALARA and ALARP principles. It will also be seen that while no worker appears to have received more than the legally permitted dose, some later contracted cancers thought to be linked with their exposure.

In 1979, Evans *et al* reported their study of 197 Rosyth Dockyard radiation workers over a period of 10 years, who exhibited radiation-induced chromosome aberrations in their blood lymphocytes. None of the workers had recorded exposure levels above the legal limit, 5 Rem (circa 50 mSv) per annum, at the time, but the study found a clear linear relationship between chromosome damage and increased exposure. The findings echoed those of an earlier, much smaller, study of workers at Windscale. While no cases of RIC were discovered during the Evans study, it illustrates that radiation can make biological changes even at relatively low doses. Daphne Gloag's work surveyed several epidemiological studies concerning the effects of low level radiation exposure, covering Japanese bomb survivors and nuclear workers. She called attention to the uncertainty surrounding the impact of very low radiation exposure, which could point to an underestimation of cancer risks.⁶⁶³ Lambert's view was that 'if a linear-dose relationship is accepted, natural radiation should be responsible for up to 10 per cent of all cancers (more in children).'⁶⁶⁴

In 1983, Douglas Black's investigation of childhood leukaemia in Seascale, near Sellafield, Cumbria, concluded that while leukaemia in the area could be attributable to discharges from the nuclear power station, this was not certain and other factors, such as background radiation could also be the cause. The recommendations of the inquiry led to the establishment of the Committee on Medical Aspects of Radiation in the Environment (COMARE). Circa 1987 the NRPB advised that restrictions on individual exposures should be adopted. In the same year, the nuclear industry responded by voluntarily adopting annual limits of 25 to 30 mSv and two years later, in 1989, the MoD also adopted a

concerning the genesis and application of LNT model listed in PubMed (<http://www.ncbi.nlm.nih.gov/pubmed/>).

⁶⁶³ D. Gloag 'Risks of Low Level Radiation – the Evidence of Epidemiology' *British Medical Journal* 281 (November 1980).

⁶⁶⁴ Lambert *How Safe is Safe?*, p253.

maximum annual limit of 30 mSv. The Ionising Radiations Regulations 1999 introduced a limit of 20 mSv per annum or 100 mSv in five years, with not more than 50 mSv in any one year.⁶⁶⁵ The MoD's current self-imposed limit is 15 mSv pa. For Chatham Dockyard radiation workers, however, the MPD was 50 mSv pa until the Dockyard closed in 1984.⁶⁶⁶

Though the association between radiation and cancer is long established, analyses of the NRRW data has revealed a lower mortality rate among classified nuclear workers exposed to low doses of radiation, which they refer to as a 'Healthy Worker Effect' (HWE).⁶⁶⁷ This was also reflected in the MRC's mortality study of the Atomic Weapons Establishment at Aldermaston, which found that mortality was '23 per cent lower than the national average for all causes of death and 18 per cent lower for cancer'. Similarly, a mortality study of UKAEA employees, from 1946 to 1997, found that 'Overall, radiation workers at UKAEA showed no excess mortality'. This latter study was designed and carried out by the London School of Hygiene and Tropical Medicine along with the UKAEA.⁶⁶⁸ A large study of US shipyard nuclear workers also concurred with these findings.⁶⁶⁹ Sponsler and Cameron, who later published a summary of the study, but who were not involved in the research, explained that the HWE occurred in many professions in comparison with the general public because employee populations excluded people who were too sick to work or commute and also included fewer individuals with serious drug or alcohol abuse problems.⁶⁷⁰ The NRRW also noted that the HWE may reflect 'a degree of health selection for employment', i.e. only healthy workers were selected for radiation work in the first place.⁶⁷¹ Their study compared the nuclear workers with non-nuclear workers of similar age and trade and controversially concluded that rather than any risk associated with low level radiation work, there were only health benefits, even suggesting

⁶⁶⁵ <http://www.hse.gov.uk/radiation/ionising/doses/>.

⁶⁶⁶ While the Dockyard closed in 1984, the Health Physics building was decontaminated and demolished in 1985 and all remaining radioactive waste was finally disposed of by 1989, with the exception of radioactive waste in a special burial site, which remained under MoD surveillance until 2011.

⁶⁶⁷ Muirhead *et al* *Third Analysis of the National Registry for Radiation Workers*, p1.

⁶⁶⁸ W.D. Atkinson *et al*, 'Mortality of employees of the United Kingdom Atomic Energy Authority, 1946-97' *Occupational & Environmental Medicine* 61:7 (2004).

⁶⁶⁹ R. Sponsler and J. R. Cameron 'Nuclear shipyard worker study (1980-1988): a large cohort exposed to low-dose-rate gamma radiation' *International Journal of Low Radiation* 1:4 (2005).

⁶⁷⁰ Sponsler and Cameron 'Nuclear shipyard worker study (1980-1988): a large cohort exposed to low-dose-rate gamma radiation', p472.

⁶⁷¹ Defence Committee *Twelfth Report*, p27.

that low level radiation had beneficial anti-inflammatory properties.⁶⁷² Their study was funded by the US Department of Energy and its impartiality cannot, therefore, be assumed. Indeed, in 1991 the US Department of Energy published a Health Bulletin concerning the study and reassuring workers in private shipyards that carried out nuclear work:

The Johns Hopkins study found no evidence to conclude that the health of men involved in work on nuclear-powered ships has been adversely affected by exposure to low levels of radiation incidental to work on these ships.⁶⁷³

Sponsler and Cameron's views are echoed by proponents of the theory that low level radiation produces hormesis, i.e. it acts as a stimulant to the DNA repair system in cells and therefore decreases the risk of aberration and the development of tumours. This view contradicts the LNT hypothesis, which forms the basis of UK and US policy. The hormesis theory was accepted by the French, Japanese and Chinese governments. This is unsurprising given that France relied heavily on nuclear power, one third of Japan's energy needs were, until recently, met by nuclear power generators and China had 16 nuclear power plants operational and a further 26 under construction in 2012. It should be noted that levels of public trust in nuclear power plants, particularly in Japan, has fallen since the Fukushima disaster in March 2011. Consequently, by March 2013, just two of the country's 54 power stations were still in operation and the final two were expected to be shut down, as government officials failed to sign off on their restart after routine maintenance.⁶⁷⁴ As mentioned, the UK currently follows the LNT theory and since the mid to late 1990s, the MoD's official line has reflected this:

We recognise ... that any exposure to radiation involves risk. We endeavour to make that risk as small as we can. We have certainly succeeded in reducing the risk over the years. However, so long as we need to continue to use nuclear submarines for the defence of the country, the risk associated with exposure to radiation will not be completely eliminated.⁶⁷⁵

⁶⁷² Sponsler and Cameron 'Nuclear shipyard worker study (1980–1988): a large cohort exposed to low-dose-rate gamma radiation', p473.

⁶⁷³ http://www.hss.energy.gov/publications/esh_bulletins/BULL0068.html.

⁶⁷⁴ *National Geographic News* 8 March 2013

<http://news.nationalgeographic.com/news/energy/2012/03/120309-japan-fukushima-anniversary-energy-shortage/>.

⁶⁷⁵ Connor *Radiation Protection in Naval Dockyards*, p10.

Uncertainty as to the true effects of low-doses of radiation remains. There have, however, been some highly publicised cases of disease believed to be induced by radiation exposure in former Chatham Dockyard workers. Before these cases are discussed, the historical context of the employment of radioactive substances generally and within Chatham Dockyard follows.

The pioneering research of Marie Skłodowska-Curie on radioactivity is well known, as is her demise in 1934 as a result of aplastic anaemia, which was caused by her long years of exposure to radiation. Much knowledge regarding the effects of radiation has been compiled through the study of atomic bomb survivors in Japan and this data is still regularly reviewed in the light of recent developments in knowledge. In his contribution to the 1954 Conference of the British Occupational Hygiene Society on Radiation Hazards in Industry, however, A.S. McLean also referred to ‘an impressive list of patients, who have been injured by prolonged and relatively low-level exposure of one sort and another’.⁶⁷⁶ His examples included uranium ore miners from Saxony and Bohemia, who suffered irradiation of the bronchi and lungs by radium and its products of decay present in the dust of the mines. Perhaps more widely known were the ‘radium girls’ who worked for the US Radium Corporation, which specialised in application of luminous paint to watch face and instrument dials, although it also produced glow-in-the-dark crucifixes and light pulls. These workers, mainly women and girls (some as young as twelve years old) were employed during the First World War and in the 1920s to apply the luminous paint, the ingredients of which included radium and mesothorium. The workers were ignorant of the danger presented by the paint and when later studying the workers, physicist Robley Evans, explained:

In painting the numerals on a fine watch, for example, an effort to duplicate the shaded script numeral of a professional penman was made. The 2, 3, 6 and 8 were hardest to make correctly, for the fine lines which contrast with the heavy strokes in these numerals were usually too broad, even with the use of the finest, clipped brushes. To rectify these too broad parts, the brush was cleaned and then drawn along the line like an eraser to remove the excess paint. For wiping and tipping the brushes workers found that either cloth or their fingers were too harsh, but by wiping the brush clean between their lips the proper erasing point could be obtained.⁶⁷⁷

⁶⁷⁶ A. S. McLean ‘The Health of Workers Exposed to Ionizing Radiations’ *British Journal of Industrial Medicine* 12 (1955), p143.

⁶⁷⁷ Caulfield *Multiple Exposures*, p30.

The consequent chronic radium poisoning, in some of the women, affected the blood-forming tissues and bones, causing highly malignant growths.⁶⁷⁸ Many of the women also suffered from anaemia, internal bleeding, cataracts and loose teeth.⁶⁷⁹ 1,000 women employed in luminous dial painting with radium participated in Evans' study; by 1980, 200 had died with the most common cause being breast cancer.⁶⁸⁰ In the 1920s and 1930s radium was also used by the medical profession to treat high blood pressure and other conditions. The resultant health issues, suffered by some of those patients 20-30 years later, were among the examples used to estimate maximum permissible levels of radiation exposure for use by industry.⁶⁸¹

The biological dangers of radiation were known to the earliest wartime nuclear workers and radiation-protection technicians were appointed in the early nuclear reactors. Much of the knowledge at this time was obtained from much earlier experiences with X-rays and radium and after May 1945, the short-term effects of radiation dosages from the bombs dropped on Hiroshima and Nagasaki. Initially, it was believed that once a reactor became operational there would be no need for personnel to re-enter it. As reactors became more complex and workers were required to interact with them for routine maintenance purposes, so the risk intensified. 'Biological shields' (barriers made from neutron-absorbing materials, such as lead or concrete) were built to protect workers, although these frequently had to be bypassed for maintenance work or repairs.⁶⁸²

Nuclear radiation work at Chatham Dockyard

Work involving radiation had been undertaken in the Royal Dockyards long before the first nuclear submarines were due for refit. During the Second World War the Navy's use of industrial radiography in its shipbuilding programme increased substantially. In 1946 the availability of man-made gamma ray sources such as cobalt and iridium, which were much

⁶⁷⁸ For more detail on the plight of the radium girls, see Clark *Radium Girls* and Caulfield *Multiple Exposures*, pp29-37.

⁶⁷⁹ Clark *Radium Girls*, p197.

⁶⁸⁰ Gloag 'Risks of Low Level Radiation, p1481.

⁶⁸¹ McLean 'The Health of Workers Exposed to Ionizing Radiations', p143.

⁶⁸² S. F. Johnston *The Neutron's Children: Nuclear Engineers and the Shaping of Identity* (Oxford: OUP, 2012), p210-11.

stronger and less expensive than radium, was a boon for industrial radiography. X-rays showed up weak and badly made welds, which were especially detrimental in submarine construction. Dai Evans recalled that:

... it was particularly important on the hulls of submarines if you had a slag or blow hole like in a plate that was a weakness and a depth charge would perhaps smash it up.⁶⁸³

Of course, the pressure placed on the submarines when submerged was also a factor.

Thomas 'Oscar' Foreman, former electrical fitter from 1956 until 1983, explained that:

Remote operation sources, also known in some instances as 'pencil sources', were normally housed in a lead container attached to a holster for transit to the work site. The source was then extracted from the protective container, attached to various forms of bracketry, sleeved in polythene and inserted into pipework enclosures and housings to examine welds and obtain radiographic images.⁶⁸⁴

The work of the Chatham Dockyard Non-Destructive Testing (NDT) Centre was featured in a *Periscope* article titled 'Meet The Men Who Can See Through Metal' (see figure 6.2), which referred to safety issues associated with the work:

One big headache for the centre is that most of the work is Afloat and, because of the danger of radiation from the X-ray tests, other work in the submarine has to be stopped while the tests are carried out. Radiographers are therefore known as an "interference trade", and much of their work has to take place when other trades are not working, as in the "silent hours" at lunchtime and in the evenings ... Barriers have to be erected with flashing warning lights, and an audible "froghorn" warning sounds during the test. Their equipment is portable, transistorised and can be operated by [remote] control, so that the radiographers themselves are in no danger.⁶⁸⁵

Dockyard workers may also have had to deal with ships that were contaminated with radiation during nuclear weapons testing. Certainly in 1957 the Admiralty issued temporary safety precautions while a manual was being prepared to deal with the removal of radioactive contamination in ships. The temporary precautions were circulated to

⁶⁸³ Group interview G2003/3.

⁶⁸⁴ Letter from Thomas Foreman, 22 January 2013, p4.

⁶⁸⁵ *Periscope* June 1980, p7.

admirals superintendent at Portsmouth, Devonport and Chatham Dockyards on 5 June 1957 and included 'General Radiological Safety Precautions', 'Radiological Decontamination Procedures' and a report on 'Techniques for the Decontamination of Ships and the Cleansing of Personnel'. The covering memorandum mentioned that copies of the US Navy (Bureau of Ships) Shipyard Industrial Radiological Manual had been supplied in 1953. It also stated that training was to be provided on radiation monitoring in order to form trained teams, which would each consist of a radiac safety officer (inspector of shipwrights), assistant to radiac safety officer (chargeman of shipwrights), nine radiac monitors who would form a 'survey team' and 3 radiac checkers who would form a 'clearance team'.⁶⁸⁶ On 14 November 1961, the director of dockyards wrote to the admirals superintendent at all of the Dockyards, including Gibraltar and Singapore, to advise that BR 2022 had been prepared with the objective of 'providing information for personnel who may be required to monitor and decontaminate ships and environs which may have been exposed to radioactivity arising from nuclear explosions or accidents to nuclear weapons and nuclear-energy propulsion systems'.⁶⁸⁷ No evidence was found to suggest that Chatham Dockyard received a contaminated vessel before the commencement of nuclear submarine refitting, but the Dockyard was certainly involved in altering vessels for the purpose of nuclear weapons testing. For example, HMS *Plym* was altered at the Dockyard prior to her use as the platform for the Operation Hurricane atomic bomb test on Monte Bello Island, off Western Australia, on 3 October 1952.

The introduction of nuclear refitting in the Dockyards meant even greater levels of radiation in the workplace. The intention to adapt Chatham Dockyard for refitting and refuelling SSNs was announced to the House of Commons on 11 March 1965.⁶⁸⁸ Chatham Dockyard's Nuclear Power Department was first printed in the *Navy List* in 1966 and then consisted of a Nuclear Power Superintendent, Captain K S J Dunlop; electrical engineer, R T S Locock; and mechanical engineer, Commander M N Collis. The following year Dunlop's title had changed to nuclear power manager, Locock's to assistant nuclear power manager (electrical) and Collis' to assistant nuclear power manager (mechanical). They were joined by deputy nuclear power manager, Commander I. B. Brenton; assistant nuclear

⁶⁸⁶ TNA, ADM 234/806: *Radioactive contamination in Ships*.

⁶⁸⁷ ADM 234/806.

⁶⁸⁸ Hansard (Commons), Vol. 708 Col. 665. 11 March 1965.

power manager (refuelling), Lieutenant-Commander A. O. Gaunt and senior health physicist, P. J. Bonfield. The 1982 edition of the Navy List, details three 'nuclear' departments: Project Manager Nuclear (Refitting), Nuclear Planning Division and Nuclear Power Department. 18 senior members of staff are listed in these departments, plus a site controller (nuclear) was employed within the Yard Services Department.⁶⁸⁹

Workers were defined either as Unclassified/Approved Scheme Workers (ASW) or Classified Workers (CW). Bonfield defined the categories as follows:

Classified – All trades likely to be regularly exposed to radiation in the course of their work. Typically this is work on reactor systems, sampling system and work in A.M.S. just aft of the reactor compartment. Typical trades will be S.S. welders, electrical fitters, shipwrights, fitters, sailmakers and so on.

Unclassified – These are the trades who are not regularly exposed to radiation or who are only exposed to very low levels of radiation in their normal duties. Typically these are trades who work in the forward end of the submarine e.g. on sonar and weapons systems or persons who make occasional visits to reactor space.⁶⁹⁰

The ASW were allowed to receive up to 1.3 rems (13 mSv) of radiation dose in a year, while CW could receive up to 3 rems (30 mSv) in a calendar quarter, although they were not permitted to receive more than 2.5 rems (25 mSv) in a quarter without special authorisation. The annual exposure limit for CW was 50 mSv. Workers were medically examined prior to becoming CW and could undergo further medical examinations every 12 months thereafter. Their dose records were legally required to be maintained for thirty years and had to be passed on to subsequent employers.⁶⁹¹

SSBNs began visiting the Dockyard for minor work before the Nuclear Complex was completed, using Dock 9, which had been adapted for the work (see figures 6.5 and 6.6). The first to visit was HMS *Valiant*; she arrived in December 1966 for crew leave and assisted maintenance.⁶⁹² An anonymous note on nuclear safety termed this Docking and

⁶⁸⁹ *The Navy List* 1982, pp397-8. NB. *The Navy List* 1983 is the last that mentions Chatham Dockyard and it only lists department titles.

⁶⁹⁰ CCDRW: *Radiation and You!:* Synopsis of Talk by Mr. P. J. Bonfield to PROM Whitley's 12 July 1966, p3.

⁶⁹¹ HM Naval Base Chatham *Radiation Safety*, pp12-13.

⁶⁹² *Periscope* January 1967, p10.

Essential Defects (DED) (see table 6.2).⁶⁹³ Six DEDs were undertaken before the Nuclear Complex was opened in 1968 by Admiral Sir Horace Law. Its opening was timed to accommodate the first full refit of HMS *Valiant*. It encompassed docks 5, 6, 7 and 8, with dockings taking place in all four docks, while the two-stream refitting facility was contained within docks 6 and 7. It had its own workshop, office building with clerical staff and a health physics building (see figure 6.1). It was self-contained and entry was restricted to those with written authority: a dockyard within the dockyard. Many workers were proud to be involved with nuclear refitting, which is apparent in some of the testimony quoted in this chapter.

The major refit programme commenced in 1970 with *Valiant*; the first of nine refits that typically lasted for two years (see tables 6.1 and 6.2). Some work was undertaken ‘ashore’ in the Health Physics Building, which was located between docks 6 and 7, but where specialised machines were required, work was occasionally carried out in other areas of the Dockyard outside of the Nuclear Complex. These areas would be subject to temporary radiological controls. Radioactive waste was sent to the purpose-built Solid Waste Disposal Building and then either disposed of at sea or buried in the dedicated site beside Gillingham Gate. The old Galvanizing Shop was utilised as a temporary nuclear waste store from c1973 to 1982.⁶⁹⁴ Today this is part of the University of Greenwich’s Medway campus and was previously a conference facility and visitor reception for the Chatham Historic Dockyard museum.

Jobs were created in the following trades to work in the Nuclear Complex: shipwrights, shipfitters, engine fitters, electrical fitters, electricians (radio), boilermakers, coppersmiths, painters, skilled and unskilled labourers. The *Chatham Observer* ran a series of articles between 24 September 1965 and 11 January 1966, under the title *Over The Dockyard Wall*. They described the work of different sections of the Dockyard and were designed to encourage local men to apply for the jobs that were becoming available.⁶⁹⁵ The first of the series began with a recruitment advert, promising that successful candidates

⁶⁹³ Dockings or DEDs (Docking and Essential Defects) were shorter than refits and covered routine maintenance and essential repairs between refits; they generally lasted between two and four months.

⁶⁹⁴ Unknown author and date *HM Dockyard Chatham – Radiation Work*. It is clear that it was written retrospectively by someone with knowledge of refitting work in the Dockyard and who was in a relatively senior position, perhaps a health physicist.

⁶⁹⁵ *Chatham Observer* 24 September 1965 to 11 January 1966.

could assure their future and ‘enjoy working on the latest naval ships and equipment by joining the Dockyard’.⁶⁹⁶ At this time the Dockyard was losing experienced craftspeople to private industry because of low wage levels. Engine fitters were among the heaviest losses to outside industry.⁶⁹⁷ Of the former industrial workers who responded to this study’s initial questionnaire, 20 left the Dockyard’s employ for reasons other than their retirement or the closure. Just one, Colin Moore, a boilermaker/welder from 1956 to 1970, mentioned remuneration as his reason for leaving. He left to become a welder at the British Petroleum Oil Refinery in 1962. Norman Gifford (who was a shipwright apprentice from 1942 to 1951) and Clive Stanley transferred to the Admiralty at Bath.⁶⁹⁸ A further eight left when their apprenticeships ended, which could equally be due to higher wages for similar work outside or because they decided that the particular trade was not for them. Derek Hargrave, shipwright from 1952 to 1966, left to work at the Royal Mint after studying Work Study at night school; he did not want to wait for promotion at the Dockyard, which could take years because of the amount of competition.⁶⁹⁹ The expectation of a job for life was still evident among workers during this period, which suggests that some people were still prepared to accept lower wages in return for job security and a pension. This did not, however, stop them from trying to obtain higher wages once they had their jobs.

Remuneration became a common subject of articles in *Periscope* in the 1960s and 1970s. Though not known for their militancy, Chatham workers protested against their low wage levels with strikes and stoppages in the 1970s, aware that the tight refit schedule and shortage of workers could work in their favour. In 1970 a dispute over welders’ pay resulted in a delay of two days to *Valiant*’s refit, because 14 welders due to start a round-the-clock, seven-day-a-week operation refused to work shifts or overtime.⁷⁰⁰ When it came to their wages, Chatham Dockyard workers were not willing to suffer in silence! In 1972 permission was given for the Dockyard to take on casual workers despite a general recruitment ban. A recruitment drive began in earnest to find coppersmiths and engine fitters. Wage levels improved and applications started to come in:

⁶⁹⁶ *Chatham Observer* 24 September 1965

⁶⁹⁷ *Periscope* June 1966, p1 and November 1972, p1.

⁶⁹⁸ Questionnaires 140 and 181.

⁶⁹⁹ Questionnaire 60.

⁷⁰⁰ *Periscope* December 1970, p1.

As a result of the better money now being offered there has been a marked upsurge in the number of craftsmen who are asking about jobs in the ‘Yard, including mechanical fitters, electrical fitters and coppersmiths, whose recruitment is so vital.⁷⁰¹

Some 140 men were selected for employment, but the problems continued. In April 1974 two-stream refitting in the Nuclear Complex was threatened by a lack of volunteers for work in the submarines’ reactor compartments. Rather than any reflection of workers’ concern for their safety, this was because pay and allowances were not attractive enough.⁷⁰² Two years later 11 mechanical fitters refused to work in the reactor compartments of two SSNs when their claim for increased craft pay was rejected. Their pay was stopped and a further 60 mechanical fitters ceased work for two hours on 20 April in support of their colleagues.⁷⁰³

Despite issues with staffing, by October 1975, the Dockyard began to take on work for three submarines simultaneously. At that time *Conqueror* joined *Dreadnought* and *Churchill*, in dock.⁷⁰⁴ In 1979 the refitting facilities were extended to encompass No 5 dock also and *Dreadnought* was the first SSN to use the facilities. Boniface mentioned the unexpected amount of work needed on her:

Indeed *Dreadnought*’s DED ... was the first to use the new nuclear refitting facilities provided in No 5 dock. Many of the workers at Chatham Dockyard were surprised when the extent of work on *Dreadnought* was published. For a mini refit lasting only five months there was an unusually high amount of restorative and improvement work to be carried out on the submarine. Amongst many items on the agenda were a complete change of *Dreadnought*’s glass reinforced plastic dome for the Type 2001 sonar. This particular repair was the first of its kind for Chatham Dockyard. Additionally *Dreadnought* received repairs to her casing fairings and an expensive upgrade was carried out on the hunter-killer’s reactor instrumentation to bring it up to the new nuclear safety standards.⁷⁰⁵

⁷⁰¹ *Periscope* December 1972, p1.

⁷⁰² *Periscope* April 1974, p1.

⁷⁰³ Hansard (Commons) *Chatham Dockyard (Nuclear Reactor Compartment)* 9 May 1978 v 949 c459W

⁷⁰⁴ P. Boniface *Dreadnought: Britain’s First Nuclear Powered Submarine* (Penzance: Periscope Publishing, 2003), p71

⁷⁰⁵ Boniface *Dreadnought*, p74.

Stuart Gregory, former electrical technician from 1963 until 1982 (he left at the end of the last SSN refit), described some of the work that he undertook on SSNs:

I spent 1970 to 1978 working on what was known as the 'Dockside Test Organisation'. Once Electrical equipment started to be replaced into the submarine under refit, it had to be checked for installation, then slowly, and working strictly to documentation, fuses were installed and the equipment finally fully commissioned. The equipment involved was of all types, from running small motors in the bilges to timing the drop times for the reactor control rods in the reactor compartment. From 1978 to 1982 I worked in the 'Nuclear Standards Branch'. This involved monitoring all work carried out in the reactor compartment to ensure the reactor and all its ancillary equipment was protected from any accidental damage.⁷⁰⁶

Clive Stanley, engine fitter apprentice then draughtsman (PTO IV) from 1967 to 1978, worked in the Nuclear Complex between 1970 and 1973. As an apprentice he spent three months with Yard Services Management (Nuclear), three months with Submarine Weapons Afloat and three months with Nuclear Fitters Afloat. His tasks ranged from the maintenance of shore-side service support systems to the refit and repair of torpedo tubes and ancillaries. Once qualified, he spent three months as a draughtsman attached to the Dockside Test Organisation (DTO), testing and trialling systems and equipment, including nuclear reactor sub-subsystems. He then joined the Design Division, where one of his tasks involved the identification and tagging of joints in *Dreadnought's* ballast tanks.⁷⁰⁷

Andrew Easdown, technician apprentice (hull) 1976 to 1981, worked in the Nuclear Complex from 1978 to 1979 as part of his training programme. He was motivated to apply for work on SSNs because 'The work in the Nuclear Complex was considered to be more dynamic and interesting than in other areas of the Yard. It was also an opportunity to learn something completely new to me'.⁷⁰⁸ He explained that his work involved general outfitting in the torpedo room and accommodation spaces. He was also involved in project management, job supervision and establishing the process and procedures in applying acoustic tiles to the hulls of SSNs.

Moore worked on SSNs in the 1960s. He was a chargehand with a team of six welders each shift. He explained their work on *Valiant's* reactor membrane seals:

⁷⁰⁶ Questionnaire NR1.

⁷⁰⁷ Questionnaire NR3 and email correspondence 30 January 2013.

⁷⁰⁸ Questionnaire NR2.

‘Supervision was very strict, each welder had to deposit a weld of the same length at the same time, all slag and rod stub ends were meticulously counted in and out of working areas. Vacuum cleaners were at hand for absolute cleanliness ... Each welder was proud to be selected for this first time unique task, as I was in Chatham Dockyard.’⁷⁰⁹

Although Chatham had a long history of working with submarines, much of the work required on SSNs necessitated new approaches to the work, as well as the obviously different task of working on the nuclear reactor. Cedric Salmon, shipwright from 1944, recalled some ways in which SSN work differed:

For a start you see we had to cut big holes in the submarine ... to get the nuclear house on top and get the rods, out over the main engine rooms to get the turbines out, get the diesels out. So we had to find a way of cutting these holes, strengthening the ship’s side while the hull was cut and then working for the welding and replacing all these plates. That was one bit and then there was quite a lot of modernisation, of updating of various compartments within the submarine and sometimes in fact we did, when we were doing the towed array⁷¹⁰, we had to make another little mock-up of it because it was so complex fitting all the equipment into one small corner of the submarine.⁷¹¹

As well as explaining the types of work that they undertook on SSNs, questionnaire respondents also commented on their working environment. Several were mainly office based, but Gregory remembered working in the reactor compartment and that it ‘was very cold during winter months at the early part of a refit. Access was restricted and climbing around large stainless steel pipes was very tiring’.⁷¹² Moore recalled ‘working in very confined areas which were very hot and airless, welders had regular breaks when needed, usually after each build up of weld’.⁷¹³ Ron Plum, joiner then draughtsman from 1960 to 1976, worked on SSNs periodically between 1964 and 1976. He also recalled ‘working in very confined spaces, sometimes on night shift due to accessibility problems during normal

⁷⁰⁹ Questionnaire NR4.

⁷¹⁰ Sonar array that is towed behind a submarine or surface ship. It is basically a long cable, of up to 5 km, with hydrophones that is trailed behind the ship when deployed.

⁷¹¹ G2003/2

⁷¹² Questionnaire NR1.

⁷¹³ Questionnaire NR4.

working hours'.⁷¹⁴ Brian Bridges, boilermaker from 1952, described what it was like in the reactor compartment when the cooling system failed:

... it was damned hot down there. We were sweating buckets of water. We were putting the polyblocks, what they called the polyblocks back on top of the reactor compartment, which is like a jigsaw puzzle. And you had to screw a long bolt down pick up a thread about four blocks down and this particular day there were two of us there we were trying for ages to get this thing to pick up the thread ...⁷¹⁵

An anonymous respondent made the following comments about the Nuclear Laundry inside the Nuclear Complex:

The laundry ...was inside the controlled area. It had two doors, one into the wash/decontam. area and one directly into the stores, it was not a healthy place to be. [The laundry worker's] task was to wash and dry low level contaminated overalls, rubber gloves and over shoes. It had, as I recall, two industrial washing machines plus a hydro dryer. It was about 6 [feet] by 10 [feet], no windows and a very inefficient ventilation system, couple this with some very stringent cleaning agents, and you begin to get the picture.⁷¹⁶

Understandably, one of the most written about submarines is HMS *Dreadnought*, the UK's first nuclear powered submarine. She was a regular visitor to Chatham Dockyard, where she underwent her second refit, two DEDs and was ultimately decommissioned. In fact *Dreadnought's* fate was entwined with Chatham's. In 1980 she suffered machinery damage (reportedly cracks in the cooling system) and her reactor was shut down. She was due to visit the Dockyard for a refit that was intended to keep her operational until 1988. The announcement of Chatham's closure and lack of relevant experience at Devonport influenced the decision to decommission her instead.⁷¹⁷ *Dreadnought* was the first nuclear boat to be decommissioned and the work fell to Chatham Dockyard:

A complete de-fuel of the submarine, sealing of the Reactor Plant. Special attention was paid to preserving the hull for its expected long period of inactivity in reserve, these included coating the hull to try and prevent boring marine creatures from attaching to the steel hull and to prevent corrosion generally. De-equipping was

⁷¹⁴ Questionnaire NR8.

⁷¹⁵ G2003/2

⁷¹⁶ Letter from source who wished to remain anonymous.

⁷¹⁷ See Grove *Vanguard to Trident*, p353 and K. Speed *Sea Change: The Battle for the Falklands and the Future of Britain's Navy* (Bath: Ashgrove Press, 1982), p16.

done to remove any useful materials and equipment suitable for reuse on other Royal Navy submarines. Finally arrangements were made for towing and mooring the nuclear submarine when the time arrived to take her to Rosyth.⁷¹⁸

Health and Safety, training and reassurance

Rosyth Dockyard was the first to begin refitting nuclear submarines and in 1968, T. P. Oliver of its Medical Department, published an article explaining the radiation hazard and how it was being contained. He noted that the complete removal of the hazard would mean not working with radioactive isotopes, which was not a possibility and so reduction of the hazard was the aim. He stated that this was achieved (note that the typographical errors were present in the original):

- (a) By keeping radioactive material to a minimum and by ensuring that where a choice of radio-isotopes is available, the selection is made on the basis of minimum toxicity and specific radioactivity.
- (b) By using the safest, most practical and simplest procedures at all times.
- (c) By keeping the movement of radioactive material from place to place to a minimum and under careful control.
- (d) By ensuring that radioactive waste is disposed of by the safest means.⁷¹⁹

Bonfield also set out the radiation problems in Chatham Dockyard and plans for addressing them. He began by explaining that while at full power, at sea, personnel were not allowed to enter the SSN's reactor compartment. When refitting, access was to the reactor necessary and although it would ordinarily be shut down, there was still an issue with radiation:

... during operation of the reactor, it's primary coolant of water does become slightly radioactive, although in service most of this radioactive material is, in fact, removed by a special filter. However, under operation conditions, it is possible to have certain limited corrosion of the reactor pressure circuit, which may lead to the formation of radioactive "cruds" analogous to rust and scale as you might find in a conventional boiler. These cruds collect in dead legs and similar places and form a potential source of radiation hazard during a subsequent access for maintenance to the reactor compartment.⁷²⁰

⁷¹⁸ Boniface *Dreadnought* p77.

⁷¹⁹ T. P. Oliver 'Accident Problems in a Nuclear Dockyard' *Annals of Occupational Hygiene* 11 (1968), p160.

⁷²⁰ *Radiation and You*, p1.

Regulations covering work with radiation appeared in BR 2101 from its first publication in 1956. The regulations appeared in section 10 d *Radiation hazards*. They covered the use of X-ray equipment, work in the vicinity of such apparatus or of radioactive material and work that involved the handling of self-luminous compound (the latter was also subject to its own specific regulations).⁷²¹ Those working in these areas were required to use dose measuring devices, including film badges, pocket ionization chambers or fibre electrosopes and were also subject to blood counts before they were employed in this area and every six months thereafter. BR 2053, *Radiac Instruments Handbook*, provided details of and instructions for the use and maintenance of instruments used to detect radiation. This was first published in 1959. Latterly radiation work was subject to specific standards, which no longer appeared with the health and safety regulations once BR 2101 was superseded. Unfortunately, no copies of the subsequent standards were available to research at the RDL or TNA.

The radiological protection mantra was: Time, Distance and Shielding. One questionnaire respondent explained:

We were given lectures on safety and I remember the key factors were time, distance and shielding. In other words, spend as little time as possible in problem areas, keep away as far as possible from “hot spots” and ensure adequate shielding. I also attended a long nuclear course at the RNC Greenwich which also covered safety aspects.⁷²²

Gregory also provided an explanation:

Time: It was not possible to enter a radioactive area without a ‘time sheet’. This was normally held at the Health Physics building and given to workers prior to entry into the restricted area. Entry to Restricted areas was via the Health Physics building. This card was used to record a number of facts, one of which was the time of entry and the time of exit. In this way the time duration was known and, depending on the radiation levels at the area where I was working, equated to the radioactive dose received (measured in ‘mSv – milli sieverts?’ in those days.)

Distance: the further away from radioactive sources you are, the less dose is received. A dosimeter was given to all who entered the restricted areas. These measured the dose accrued during each individual session but were sometimes subjected to some abuse eg. Removed from the person’s body and deliberately

⁷²¹ BR 2101, Section D.

⁷²² Questionnaire NR6 (anonymous).

stored in a known area of high radioactivity. A particularly useful trick for those that wanted to be removed from future work in those areas. Classified Radiation workers also had their own photographic film badge that recorded automatically the accrued dose over a period of time. These were sent to Alverstoke for developing and the results returned to Chatham to be held on record. Alverstoke also held a copy of these records.

Shielding: Lead sheets were often placed around areas of high radiation to reduce the levels.⁷²³

The Nuclear Complex was the only area in the Dockyard to have a dedicated health and safety organisation, namely the Health Physics team.⁷²⁴ In 1966, in a talk titled *Radiation and You*, Bonfield explained that:

Health Physics is essentially the branch of science connected with radiation protection ... Since the early 40's the tremendous industrial and military programmes in the nuclear field have created enormous problems in radiation protection. This has led to the formation of specialist health and safety divisions in the larger organisations ... The main purpose of the H.P. branch is to provide a system of very tight control over all Dockyard work on nuclear submarines to ensure that personnel do not incur exposures above any of the permissible legal limits set down. It is a statutory working principle that all unnecessary exposure to radiation should be avoided. Very careful planning of work and close liaison with Health Physics Branch put this principle into effect.⁷²⁵

HP staff at Chatham Dockyard consisted of four professional health physicists, 15 supervisory grades and about 60 HP monitors. The HP monitors worked in teams of six. One monitor commented that most of the monitors in his team were conscientious and aware of the hazards that radiation posed. He added: 'I think we did our best for the lad's, in spite of "push on and get it done" attitudes of some managers'.⁷²⁶ Lung monitoring facilities were available for suspected inhaled doses, but workers were usually assessed for internal contamination by the Defence Radiological Protection Service (DRPS). Chatham did not monitor biological samples, although blood samples were occasionally sent for

⁷²³ Questionnaire NR1

⁷²⁴ The term Health Physics (HP) was coined in the USA circa 1941, when work started on the Atom Bomb.

⁷²⁵ *Radiation and You!*, pp 1 & 3.

⁷²⁶ Email correspondence with respondent who wished to remain anonymous.

chromosome aberration analysis when whole body radiation overexposure was suspected. Chatham never operated its own photodosimetry service.⁷²⁷

Among the respondents to the radiation questionnaire was John Cordingley, who was promoted to health physics inspector. He worked in the Nuclear Complex from 1968 to 1981. He supervised and led a team of HP monitors, who ‘looked after nuclear workers radiation doses and checked them for contamination after vacating the reactor compartment’.⁷²⁸ Gregory recalled:

It was the job of the Health Physics monitor to stand as sentry at the reactor compartment entrance. All who entered and exited did so via his barrier. He was the one that ensured that those that entered were dressed correctly, had the correct personal radiation monitors and were authorised to work in the space. I do not recall any occasion when I or anyone else that I worked with, entered the reactor compartment without passing the monitors examination first.⁷²⁹

Stanley recalled regular patrols by HP monitors in workspace areas to ensure protective measures were in place.⁷³⁰

Eddie Pynn, progressman technical planner 1973 to 1984 and also shop steward and registered safety representative, had different recollections of the HP monitors:

... we had complained and complained several times about conditions, the lack of cover by the Health Physics people. You know, the monitoring it was, well it was a disgrace really and some people, you know, you’d have a dosimeter on to measure the amount of radiation, some people would take it off, you’d put the coveralls on before you went in the reactor compartment or contaminated areas and they’d leave their pencil [dosimeter] behind because if it got to a certain figure that’s it there was a cut off, you don’t take any more ... but there was some that didn’t want to stay down there too long so they’d take their dosimeter off and poke it in a little area where it was highly radioactive so that they’d get a big dose on their dosimeter and they’d say to them oh that’s it you can’t come in here for another fortnight or something like that, you know.⁷³¹

⁷²⁷ Unknown author *HM Dockyard Chatham – Radiation Work*, p3.

⁷²⁸ Questionnaire NR10.

⁷²⁹ Questionnaire NR1.

⁷³⁰ Questionnaire NR3.

⁷³¹ G2003/1

Cordingley did not remember coming across this practice during his shifts, but believed that it did happen. He added that it was a very serious offence.⁷³² Gregory was the only other respondent who recalled it happening and he commented:

It was not a common occurrence but it certainly did happen. Why? Placing the dosimeter/film badge in an area of high radiation levels when working in a lower level area obviously gave a falsely high reading. It made the time taken to reach the maximum allowed dose arrive sooner. Maximum allowed doses were allocated in specific time periods, eg over 1 month or 3 months. Entry to the area was then barred until the next time period arrived. A nice break from the hot, sticky environment and back to other work where the pressure was off. It was less common amongst Classified workers, because they were generally more responsible and better educated on the whole subject of Radiation. A small percentage of NON Classified workers really had no grasp of the particles and radiation involved in the nuclear submarine environment. They knew, however, that the monetary advantages of working in this environment were quite good, but there was an element of 'fear of the unknown'. After volunteering for this work maybe some thought better of it and, with pressure from their families, chose to get to max dose and get out asap!⁷³³

A health physics monitor stated that checks, to ensure workers were using protective equipment properly, were not performed often.⁷³⁴ He also highlighted the difficulty that HP monitors could encounter when trying to enforce safety protocols. He provided an example of one worker in the laundry. He explained that workers in this area were supposed to wear coveralls, a hat and rubber gloves. On several occasions he found the same worker wearing just a pair of trousers and a vest. He recalled that he '... told him off once, I think he implied that my parents weren't married among other things of a personal nature'. Despite this, he and the man concerned were on good terms.⁷³⁵ This behaviour echoes the examples in chapter 4. Indeed, the man concerned was James (Snowy) Taaffe, who worked in the nuclear laundry between 1970 and 1984 and during the last two years of his employment was promoted to inspector of health, safety and hygiene, including responsibility for disposal of protective wear and tools as nuclear waste. Taaffe's comments reflect his perception that work in the Dockyard required fearlessness:

⁷³² Questionnaire NR10.

⁷³³ Questionnaire NR1.

⁷³⁴ Questionnaire NR11.

⁷³⁵ Email from source who wished to remain anonymous.

I was apprehensive when I first went down to the Core of the Nuclear subs, but eventually I was doing 12 hour shifts ... We worked in TEAMS and each individual had to BE HONEST, Trustworthy, and most importantly unafraid of Radiation Contamination, and BLUE ASBESTOS DUST. We wore Special Clothing, MASKS and Dossimeters to check Radiation Levels. We were Paid HIGHEST RATES of Pay.⁷³⁶

These comments are indicative of the kinds of masculine attitudes and behaviour traits outlined in chapter 4.

Workers on the SSNs were required to wear white overalls, cotton gloves and white hats (see figures 6.3 and 6.4). There was some confusion over the true purpose of this attire. Its origin is recorded in a memorandum from Admiral Superintendent (AS) Rosyth, which explained that the white clothes were introduced to encourage cleanliness:

The importance of high standards of cleanliness in nuclear submarines is a constantly recurring theme. To achieve these standards is largely a question of indoctrinating workpeople and to this end it is considered that the wearing of white overalls by workmen employed inboard on DREADNOUGHT would provide an incentive to keep the work clean.⁷³⁷

Bonfield also referred to necessity of clean working in the reactor compartment, revealing that this also played a part in keeping radiation levels to a minimum:

... it is of extreme importance to keep the primary reactor circuit as clean as possible, because any material that is introduced in the form of dirt could itself become radioactive and add to the existing problem.⁷³⁸

It was also essential to avoid perspiration coming into contact with components and with the working environment reaching temperatures as high as 140°F (60°C)⁷³⁹, in some cases, practical measures were needed. Connor explained the dual purpose of the protection of systems and worker to Members of Parliament:

⁷³⁶ Questionnaire from undergraduate study of the closure of Chatham Dockyard.

⁷³⁷ ADM 1/28501 (Folder 1 or 2): *HM S/M Dreadnought – Requirements for White Overalls*. Memorandum from AS Rosyth to DGD&M, 11 October 1963.

⁷³⁸ *Radiation and You*, p2.

⁷³⁹ Questionnaire NR1.

Protective clothing is also used to protect the worker against contamination and to protect the systems from agents such as perspiration. This clothing would often be no more than an overall and gloves. It is not intended to stop radiation reaching the worker; there is no practical way of doing that. Rather the intention is to protect the worker's skin from being contaminated.⁷⁴⁰

The necessity for cleanliness was parodied by *Periscope's* cartoonist in 1975 (see figure 6.7).

Reducing the level of radiation

The reactor of a nuclear submarine works on a similar principle to any other boiler and like conventional boilers and domestic kettles, they can suffer from deposit build-up. In nuclear reactors this is termed CRUD and it is radioactive.⁷⁴¹ Corrosion and transport of these radioactive products, through the primary system pipework, increases the radiation dose rate within the reactor compartment. At Chatham Dockyard, when radiation levels were particularly high in the submarines, a chemical treatment was used to flush out the pipework and remove radioactive CRUD and so reduce the amount of radiation that workers were exposed to. Setting up the system to perform the treatment gave rise to dosage that would not otherwise be received, however, and so this was only done where the amount of radiation removed was greater than that created by using the process. A chemical product called Turco was used. For example, during the 1974-6 refit of HMS *Dreadnought* it was predicted that an unacceptable total dose of 55 man-Sieverts (man-Sv) would arise. To combat this, Turco was used to decontaminate the primary circuit (excluding the reactor), which was believed to have reduced the total dose to 17 man-Sv.⁷⁴²

In 1980, efforts made to reduce radiation resulted in a decrease of 20%.⁷⁴³ HMS *Churchill* was believed to be the cleanest of the SSNs to refit at Chatham. The measures taken included:

⁷⁴⁰ Connor *Radiation Protection in Naval Dockyards*, p7.

⁷⁴¹ A phenomenon first discovered in the Chalk River Nuclear Laboratories, Canada and referred to as Chalk River Unidentified Deposits (CRUD).

⁷⁴² *HM Dockyard Chatham – Radiation Work*, p3.

⁷⁴³ *Periscope* August 1980, p2.

1. Re-siting sea water cooling equipment outside of the reactor compartment to enable a second entry to be cut for personnel access so that workers would no longer have to walk past hotspots to enter the compartment;
2. Installation of closed-circuit TV cameras to enable line managers to check the state of the reactor compartment remotely (this had already been achieved on HMS *Warspite*);
3. A training rig in the Nuclear Complex workshop where workers could rehearse and train in order to cut time on the job to a minimum.

Henry Steer, electrical fitter from 1950 to 1982, worked on SSNs as a classified worker from 1976. He recalled the training rig:

We had a complete dummy reactor in the Refuelling Equipment Shop, because it was a legal requirement that the four teams did a complete cycle of training which finished up with all the leaders and teams doing an observed defuelling run (practical), followed by an oral and then a written test. Despite being qualified to do the refuel and holding a certificate, each member had to re-qualify for the next submarine which included the training.⁷⁴⁴

For the second refits of HMS *Valiant* (1977-80) and HMS *Warspite* (1979-82) the entire primary circuits of the submarines were encased in preformed lead sections that were 2cm thick. This was estimated to have reduced the total predicted doses by 20%.⁷⁴⁵ While these measures were of benefit to workers, the evidence suggests that it was also motivated by shortage of CW and the need to avoid using up their dosage levels too quickly. In an article explaining measures taken to reduce the radiation dose workers would receive while working on *Churchill*'s refit, it was admitted that radiation dose levels had been a problem in previous refits. Scotland Smith, assistant manager reactor, stated:

It gives us much more freedom to operate ... without workers' radiation dose limits being approached. One of the restraints in the past has been that we have had to be careful not to exceed the accumulated radiation dose. This was a particular problem on *Warspite*.⁷⁴⁶

⁷⁴⁴ G2003/2

⁷⁴⁵ *HM Dockyard Chatham – Radiation Work*, p3.

⁷⁴⁶ *Periscope* August 1980, p2.

One of the accusations commonly directed at the MoD is that workers were not made aware of the dangers of radiation. Examples can be seen later in this chapter, but must be tempered by the following comments from both classified and non-classified workers. Gregory (classified) stated that he attended a nine-week course at Royal Naval College, Greenwich (RNC) to study nuclear physics and a five-week course in Dounreay, during which he was trained on a submarine simulator. Russell Lane, former technician apprentice from 1973 to 1978 and non-classified worker, commented that ‘Nuclear awareness was pretty high and was probably as good as the knowledge of the time permitted’.⁷⁴⁷ Stanley (non-classified) said that he was aware of the risks through his secondary school education and was aware of the procedures and controls in place in the Dockyard.⁷⁴⁸ Although Easdown (classified) felt the hazards were explained very well, he was concerned that the maximum dose rates were much higher in the UK than they were in the USA.⁷⁴⁹ Moore (non-classified) commented:

We knew the dangers, but put our trust in our employers. We had at all times Health and Safety inspectors [presumably HP monitors] taking readings of radiation levels and marking out ‘hot spots’.⁷⁵⁰

There is sufficient evidence to prove that the MoD provided extensive education for classified workers and that some level of instruction was also given to non-classified workers. As Gregory observed, however, understanding was not universal:

There can be no question whatsoever that every Classified Radiation worker working in this environment were given sufficient training. The problem was, however, that this level of training was not suitable for everyone. It was expensive and needed some degree of prior education to fully understand the physics involved. Some people could just not grasp what radiation was all about. I gave a lecture to some temporary reactor compartment workers once, explaining very carefully just how small the radiation particles (neutrons) were and how they can get to the very nucleus of our cells. One of the questions I took at the end of this talk was ‘Do you think it would be better if I no longer wear a string vest but buy a thicker one so that the neutrons cannot get through!!’⁷⁵¹

⁷⁴⁷ Questionnaire 1001.

⁷⁴⁸ Questionnaire NR1.

⁷⁴⁹ Questionnaire NR2.

⁷⁵⁰ Questionnaire NR4.

⁷⁵¹ Questionnaire NR1.

While efforts were made to educate the workers about the risks, at the same time the MoD did not want to frighten workers enough that they would refuse to work in the Nuclear Complex. Training material and articles in *Periscope* contained statistics and references intended to reassure workers. One of the methods used was to draw attention to background radiation. Bonfield provided an explanation in his 1966 presentation as a means to assure workers of the safety of maximum dose limits. He highlighted the large doses received by members of the public in other countries:

In certain parts of the world, notably in Southern India and Brazil, it has been found that the natural background radiation from radioactive materials is so high that the population is continually receiving an exposure exceeding the maximum laid down for people actually working in the nuclear industry. There is no evidence to suggest that these people have come to any harm.⁷⁵²

A similar approach is used in *Radiation Safety*, a booklet issued by senior health physicist, R.S. Iles, in 1973.⁷⁵³ Again it uses the example of background radiation in Brazil, assuring readers that no difference could be discerned in the health of people in this part of the world that could be attributed to radiation.⁷⁵⁴ This was somewhat misleading, given the divergence of scientific opinion on the effects of background radiation.⁷⁵⁵ Indeed, just seven years later Gloag commented on the effects of background radiation in places like Brazil. She argued that:

Effects would ... be hard to prove, since there is generally no more than a twofold difference in radiation dose between the areas with high and low background levels, and huge populations would be needed; in any case differences in other factors are likely that would mask any small radiation effect.⁷⁵⁶

⁷⁵² *Radiation and You*, p2.

⁷⁵³ Iles was senior health physicist at Chatham Dockyard from 1972 to 1974.

⁷⁵⁴ HM Naval Base Chatham *Radiation Safety* (Issue 2) 1973, p5.

⁷⁵⁵ Some examples include: J. Wesley 'Background Radiation as the Cause of Fatal Congenital Malformation' *International Journal Radiation Biology* 2:1 (1960) and B. MacMahon and D. Clark 'Spontaneous Leukemia and Natural Background Radiation' *Blood* 11 (1956) - quoted in A. P. Jacobson *et al* 'The Role of Natural Radiations In Human Leukemogenesis' *American Journal of Public Health* 66:1 (January 1976); W. M. Court Brown *et al* 'Geographical Variation in Leukemia Mortality in relation to Background Radiation and Other Factors' *British Medical Journal* 11 (June 1960)'.

⁷⁵⁶ Gloag 'Risks of Low Level Radiation – the Evidence of Epidemiology', p1482.

Radiation Safety did point out the dangers of high radiation, stating that in matter of days or weeks the victim would succumb to radiation sickness. Under a section titled ‘Effects of Low Long Term Exposure’, no effects are actually listed, which may have given the reader the erroneous perception that there are no effects with this kind of exposure. A table at the end of the pamphlet (reproduced at table 6.7) provided further potentially misleading information. It purportedly compares the risks of occupational radiation exposure against domestic and other occupational risks. The only ‘effect’ that it pits against these other risks is leukaemia from occupational radiation exposure, which predictably comes out quite well against the incidence of death per 10,000 miners. In the limited information collated for this study, the most prevalent cancer from radiation exposure in Chatham Dockyard workers was skin cancer, as will be seen later. Tim Robson, developed non-Hodgkins lymphoma and Keith Mitten developed a sarcoma, while an anonymous questionnaire respondent has cancer of the bladder. None of these risks were mentioned in the pamphlet. Furthermore, no mention was made of the latency of these cancers or the fact that exposure to young workers held more risk.⁷⁵⁷ It was clear that attempts were being made to avoid panic and resistance among workers. On the positive side, the safety practices seem quite comprehensive. Eating, drinking and smoking were forbidden in controlled areas. Arguably this could be as much about protecting the reactor as the workforce, but nevertheless it reduced the possibility of ingesting radioactive particles. In areas where there was a risk of inhaling radioactive particles, protective wear including respirators was provided. The polythene and other barrier materials, used to minimise the escape of radioactive particles, are apparent in figures 6.3 and 6.4. In addition to following the Radiological Protection Standing Orders, which were devised from legal requirements, ICRP recommendations and MoD regulations, workers were advised to:

1. Keep as far as possible from labelled hot spots;
2. Not sit or lean on pipes or valves when this could be avoided;
3. Discuss a job in as low a radiation field as possible;
4. Keep all time spent in controlled areas to a minimum.⁷⁵⁸

⁷⁵⁷ Gee ‘Occupational Exposures and the Case for Reducing Dose Limits’, p112.

⁷⁵⁸ HM Naval Base Chatham *Radiation Safety*, p9.

Radiation Safety was purportedly ‘produced so that everyone engaged in refitting nuclear submarines may be aware of the nature of radiation, the potential hazards that it presents, and the need for special precautions to ensure the safety of personnel’.⁷⁵⁹

The January 1977 issue of *Periscope* published the following statement from a series of lectures designed to put workers at ease:

The chances of a nuclear accident happening at Chatham are as remote as the possibility of a Jumbo jet crashing on Fulham football ground on a Saturday afternoon.⁷⁶⁰

Workers were also told that a radiation worker’s job was safer than a doctor’s; 20 times less risky than mining and 30 times less hazardous than working in the construction industry. These statistics were provided by the ICRP. Interestingly no comparison was made with other work in the shipbuilding, ship-repairing and marine engineering industry, which as the statistics in chapter 3 demonstrated, had higher accident rates per 100,000 workers than manufacturing and construction in the 1970s. Bernard James, senior health physicist from 1975 to 1978, stated that the apprehension felt by many Dockyard workers about working with radiation was ‘... due entirely to lack of knowledge of the stringent safety measures taken for all personnel working in radiation areas’. James also stated that it was hoped that the talks would ‘encourage more people to work in the Nuclear Complex and help with the Dockyard’s main task of refitting nuclear submarines’.⁷⁶¹ Five series of these lecture were run; 1,120 workers or 14% of the workforce attended them.

A tight schedule

The introduction of nuclear submarine refitting also required a sea change in the culture of the Dockyard. The Dockyard was not new to tight schedules. In the 1860s, the Admiralty placed pressure on the Dockyard to complete construction of HMS *Achilles* quickly and cheaply. Consequently, conditions suffered and workers were forced to rush their lunch breaks, covered in dirt and chemicals:

Hark! Is that 12 striking? With my hands covered in paint and candle-grease and dirt, my face black as a sweep, my throat like a flue, full of soot; my dinner forms a

⁷⁵⁹ HM Naval Base Chatham *Radiation Safety*, foreword.

⁷⁶⁰ *Periscope* January 1977, p2.

⁷⁶¹ *Periscope* January 1977, p2.

sweep's brush, cleaning the space as it goes down. I wish those who have their dinners without a pair of gloves made of tallow grease and soot and have a table instead of their knees would drop among us just after 12; then they would have no need of visiting the Zoological Gardens.⁷⁶²

Nuclear submarine refitting schedules were tight and required detailed planning. In December 1970, the General Manager sent the following message out to workers:

We must get ships out on time ... There has been an ingrained fear of working oneself out of a job ... the fear that if you produce a job quickly it will lead to redundancies and discharges.⁷⁶³

While this applied equally to surface vessels refitting in the Dockyard, particularly as refit and repair work was being sent out to contract because of delays in the Dockyards, it highlighted an ingrained attitude that needed to be overcome if SSN refitting was to be successful. Gregory remembered the pressure that he and his colleagues were under to meet the deadlines:

I certainly was very aware of the tight refitting schedules. The entire refit planning was on a 'reaching milestones' basis. The critical path for the schedule was worked out before the submarine even arrived at the Dockyard. Then, the refit progress was tracked against the schedule, and it was very serious if the milestone dates were allowed to slip. If they did, we all had to have our own excuses why we were not to blame. The engineering task was huge. Things did go wrong, equipment did fail. These were unavoidable delays for which no-one took the blame. We were all aware that serious delays were brought to the attention of politicians and MOD civil servants. The refit managers were under a lot of pressure to keep to the milestone dates ... I, and almost everyone on the site, were aware of the tight refit/refuel schedules. We all felt under pressure to get it right first time and on time.⁷⁶⁴

He also recalled that a Plan of the Day (POD) meeting was held first thing every morning and that a representative from every group working on the ship was required to attend. The chairman would provide a progress report and all attendees had to state what they would be

⁷⁶² M. Waters 'Changes in the Chatham Dockyard Workforce, 1860-90. Part I: From wood to iron: change and harmony, 1860-87' *Mariner's Mirror* 69:1 (1983), pp60-1.

⁷⁶³ *Periscope* December 1970, p1.

⁷⁶⁴ Email correspondence with Stuart Gregory, 26 November 2012.

doing on the submarine that day and advise of any delays. Gregory commented that it was 'Quite frightening, [especially] if you were the one that was delaying somebody else.'⁷⁶⁵

As the refit programme progressed and skilled classified workers began to use up their dose allowances, to avoid them becoming 'burnt out', workers with similar skills were temporarily recruited from departments working on surface ships in order to work in areas of high radiation (termed 'hotspots').⁷⁶⁶ In turn, workers from other UK Dockyards were drafted in to cover the surface ship work (if these workers possessed relevant skills, they too would be offered work in the Nuclear Complex).⁷⁶⁷ John Large, nuclear engineering consultant and author of a report produced for Rochester City Council on Chatham Dockyard's radiation safety, also commented on this practice and showed that it was not confined to Chatham Dockyard:

The managers of the dockyards became very, very nervous about planning this finite resource, how to extend it, as the submarine started to inch through its refit work. So at a certain time you see managers were writing notes. At Rosyth for example a chap called Sharp writes a note that says "I'm running short of spare radiation dose. I need to introduce some people from the other parts of the yard, the non-nuclear yard, to do work on the submarine so that I can hold my classified workers in contingency should something else happen."⁷⁶⁸

Former classified fitter Terry Deadman contributed a short article to the CCDRW newsletter, in which he explained that this practice began when a problem was discovered with welding in one of the first submarines to visit the Dockyard. The pipes on the SSNs were made from one of two metals: stainless steel and mono metal. In this particular case, the stainless steel weld had been used on some mono pipes, which compromised the strength of the welded joint and caused a leak risk. Consequently, all of the welds in the reactor system (some 20,000 in total) had to be filed and buffed to produce samples for analysis in the laboratory to ascertain whether incorrect welds had been used anywhere else. Ultimately, all incorrect welds would need to be replaced. Drawing Office staff located and tagged all of the welds and the fitters were tasked with retrieving the samples. Deadman explained that when the sampling started there were just 25 classified fitters

⁷⁶⁵ Email correspondence with Stuart Gregory, 26 November 2012.

⁷⁶⁶ CCDRW 'Introduction' written by CCDRW's researcher to accompany the Chatham Dockyard incident reports, no date, p1.

⁷⁶⁷ Letter from Thomas Foreman, 22 January 2013, p3.

⁷⁶⁸ BBC Panorama *The Price of Peace*.

working on a three-shift system. Many of the welds were located in radiation hotspots, which meant that the maximum dose could be received in a matter of hours, days or weeks:

This soon created a dose problem with reactor fitters who were alleviated, to some extent, by the introduction of non-classified workers, approved scheme workers, which consisted of fitters from all over the dockyard to come and work for a period of time often in the 'hotspot' areas where the radiation dose was highest. We nicknamed them 'sponges' soaking up the radiation. The dose problem was to become the biggest problem throughout the whole of the nuclear refitting programmes, leaving a lifelong legacy for the classified worker and unclassified 'sponges'.⁷⁶⁹

Kevin Sansom, who was one of the unclassified workers taken on for temporary work on SSNs, recalls:

They brought in people from the other parts of the yard who had never worked in the environment of reactors at all. They were just turning round, got offered the money and as far as they were concerned it was better [than] what I'm earning here. I haven't got to do the long hours like I would do if I'm working in the workshop or whatever it is and they go in and basically they work all the hours under the sun to do that particular job, even regardless if they get burnt out or whatever. We were called human sponges.⁷⁷⁰

Keith Mitten recalled working on HMS *Valiant* and that his dose allowance was used up within half an hour: 'We couldn't go back down again after that for months'.⁷⁷¹ Mitten developed a soft tissue cancer, a sarcoma, on the back of his knee in the 1990s. Although the cause of such cancers is unknown, they have been found on parts of the body that have previously been treated with radiotherapy. There is some possibility; therefore, that Mitten's sarcoma was caused by his exposure to radiation in the Dockyard. Sarcomas have also, however, been shown to be linked to certain hereditary conditions and to exposure to certain chemicals.

In 1958, Sir Leonard Owen, then managing director, UKAEA Industrial Group, commented that:

⁷⁶⁹ T. Deadman 'Birth of the Nuclear Sponge' *Campaign for Chatham Dockyard Radiation Workers Newsletter* (date unknown), p2.

⁷⁷⁰ Kevin Sansom in BBC Panorama *The Price of Peace* televised on 26 January 1998. Transcript available at: http://news.bbc.co.uk/1/hi/english/static/audio_video/programmes/panorama/transcripts/transcript_26_01_98.txt.

⁷⁷¹ BBC Panorama *The Price of Peace*

... the [UKAEA] has always put as the paramount issue the necessity of meeting the Defence Programme. Shortages of men or materials or knowledge were not allowed to jeopardize this. The times given were such that risks had to be accepted.⁷⁷²

These comments reflect the MoD's primary priority: the defence programme and nowhere was this more apparent than during the construction and maintenance of the nuclear fleet. The evidence considered during this study suggested that time pressures and demand for manpower resulted in safety protocols being side-stepped. This trade-off between the progression of nuclear medicine, power and weapons programmes and the dangers of radiation exposure were not unique to the MoD. The BEAR committee opined that 'any radiation in addition to the inescapable natural background radiation is unfortunate and harmful from a genetic point of view', but at the same time did not recommend the prohibition of all extra dosage because it would put an end to the medical and military use of radiation.⁷⁷³

Incidents

Over the years, we have made steady progress in reducing radiation doses to workers, exploiting improvements both in technology and in working practices. This process continues. However, we are not perfect. Mistakes are made and have been made in the past. Accidents happen. Happily, few, if any of these accidents have had significant consequences and we try to learn from our mistakes.⁷⁷⁴

John Connor, circa 1998

I think in the main [safety standards] were adhered to. I think that in the very early days that there might have been some breaches and therefore we have to acknowledge that and therefore have to look at where that occurred and that is obviously part of the records we have to look at ... I think it is probably the case that a limited number of workers may have had levels of radiation. We've never contradicted that. Indeed that's exactly why we look back on individual's records in order to try and see what happened in individual cases.⁷⁷⁵

John Spellar, 1998

⁷⁷² Johnston *The Neutron's Children*, p215.

⁷⁷³ Caulfield *Multiple Exposures*, p135.

⁷⁷⁴ Connor *Radiation Protection in Naval Dockyards*, p8.

⁷⁷⁵ BBC Panorama *The Price of Peace*

By the time the Nuclear Complex was commissioned, procedures and regulations for safe and secure work with radiation were well established. Radiation workers were trained and had some knowledge of what radiation was and its dangers, although it is possible that the true risk was played down in order to avoid panic among the workforce. There is evidence of incidents that undermine the MoD's assertion that radiation workers were safe. When things went wrong and unnecessary radiation risks were caused, incident reports were made. By law the MoD is required to keep, for 50 years, incident reports concerning any over-exposure of an individual, the exposure of an individual that had caused a relevant dose limit to be exceeded, significant release, spillage or loss of radioactive material. The following examples are in direct conflict with the image of the state of the art Nuclear Complex, where workers were purportedly safer than in any other part of the Dockyard.

Gregory recalled that a number of incidents occurred including ingestion and contamination by active water, although he did not witness them himself.⁷⁷⁶ His own total radiation dose summary to 2006 was 136.09 mSv.⁷⁷⁷ An incident in 1979 involved seven fitters, who had been tasked with removing pipework from HMS *Conqueror*'s bilge tanks and placing it in the dockside lay-apart store. They were issued with a Work Instruction that was incorrectly issued and so did not alert them to the potential radiation hazard. The HP Department had not been informed of the task either and so no hazard warning barriers had been erected and no HP supervision was provided. Subsequently, the senior health physicist recommended that 'emphasis should be placed on the need for individual awareness of radiological hazard and personal protection, when planning future educational needs for the workforce'.⁷⁷⁸ This is not an isolated example. A remarkably similar incident occurred in 1982, with the men cleaning HMS *Churchill*'s active waste tanks, which suggests that the senior health physicist's recommendations were either not taken or were ineffective. On 1 April 1982, John Gibson and Robert Spillett, were instructed by their supervisor to clean paint from the active waste tank of HMS *Churchill*. Ordinarily, this type of work would be subject to written work instructions concerning the radiation hazard; in this case, the instructions were not passed to the supervisor prior to job being allocated to the workers. Consequently, the men worked for three nights without adequate protection

⁷⁷⁶ Questionnaire NR1.

⁷⁷⁷ Email correspondence with Stuart Gregory, 26 November 2012.

⁷⁷⁸ Letter from Thomas Foreman, 22 January 2013, p2.

against the contaminated paint that they were chipping from the tank.⁷⁷⁹ Both men were found to have inhaled radioactive particles, the dose in each case was stated to be equivalent to half the dose received from a normal chest X-ray and 15 per cent of that received from a mass-miniature (i.e. mobile) X-ray unit. In addition to the risk to the men themselves, their ignorance of the danger meant that they did not remove their overalls before leaving the area and could potentially have contaminated common areas. Gibson said that, despite the wearing of overalls in staff restaurants being forbidden, that he and Spillett ‘... wore our overalls into the dining room and rest room’.⁷⁸⁰ They also potentially took contamination into their homes on their own clothes worn underneath their overalls, on their skin and in their hair. The level of contamination appears to be played down in the Under Secretary of State for Defence Procurement, Geoffrey Pattie’s response. The local papers stated, however, that the Geiger counter checks performed on the men, when they finally reported to the Health Physics Department, showed that Gibson had radioactive particles on his overalls and his left foot.⁷⁸¹ Eddie Pynn, shop steward, recalled that Health Physics personnel visited the men’s homes and ‘burnt their bedding and all sorts’.⁷⁸² Pynn was concerned that the incident was being covered up and so he talked to Salford-East MP, Frank Allaun, a known campaigner against nuclear armament and also the press:

I took it to the House of Commons this problem. They wanted to cover it up in here and ... I was warned off because I shot my mouth off about it, so I was told that it’s Official Secrets Act so I couldn’t say anything, so I went up to the House of Commons and lobbied a load of MPs that I knew would be sympathetic and an MP called Frank Allaun from the Liverpool area ... got in touch with an Observer correspondent and he came down, I give him the full story, I even brought him in there and took him round, just rode through the gate and held my pass up and he took photos and it was front page of the *Sunday Observer* and of course all hell was let loose then.⁷⁸³

⁷⁷⁹ Pattie claimed that the lint dust masks that the men wore as part of their normal protection in non-nuclear chipping work help to protect them from inhaling more radioactive particles – see Hansard, Commons, 11 May 1982 vol 23 cc 247-8W.

⁷⁸⁰ CDHS Ref 6: newspaper cutting from *Evening Post* 23 April 1982.

⁷⁸¹ CDHS Ref 6: newspaper cutting from *Chatham News* 23 April 1982.

⁷⁸² G2003/1

⁷⁸³ G2003/1

Allaun raised a number of questions in the House of Commons on 22 April 1982, which Pattie answered the following month.⁷⁸⁴ MOD internal procedures were deemed sufficient to investigate the incident and so no Board of Inquiry was convened. In the press, Dockyard management was criticised for lack of supervision, which was due to so many workers being transferred in anticipation of the Dockyard's closure.⁷⁸⁵ Pattie, however, claimed that the previous supervisor's replacement was 'qualified for the purpose and there have been no other changes to line management in this area'.⁷⁸⁶ Without access to the MOD's Technical Investigation report it is impossible to unpick the true reasons behind this incident. There is a suggestion that the men themselves held some of the blame. Gibson admitted to the press that 'In the end we did come across one sign which had been turned round at the back of the tank'⁷⁸⁷ and Pattie stated that 'two other men and their supervisor from a different trade saw it and reacted appropriately'.⁷⁸⁸ This should not detract from the fact that the requisite work instruction was not supplied in the first place.

On 25 July 1970, John Care, an engine fitter and classified worker, received a high dose of radiation to his lungs whilst working on the refit of HMS *Valiant*. The job itself involved removing CRUD from the interior of one of the valves in the submarine's reactor water circuit, using a powered hand-held polishing tool. The job was to be undertaken using a protective 'glove box' and vacuum extraction, to avoid radioactive particles entering the workspace and being inhaled or ingested. This arrangement meant that Care was holding the polisher through a rubber glove sealed inside a Perspex box. When the vacuum was operating, the suction was so strong that the glove was distorted making it difficult for Care to hold on to the hand tool and carry out his task. In order to finish the job, Care asked the nuclear inspector supervising his work, to turn the vacuum off. Having worked for 45 minutes without the vacuum running, Care returned to the dockside change room, where he was found to be heavily contaminated with radiation. The air inside the polythene tent he had worked in was tested and found to contain 50 times the MPD. External radiation was

⁷⁸⁴ Hansard, Commons, 11 May 1982 vol 23 cc 247-8W

⁷⁸⁵ CDHS Ref 6: newspaper cutting from *Chatham News* 23 April 1982: Report by David Hannah.

⁷⁸⁶ Hansard, Commons, 11 May 1982 vol 23 cc 247-8W

⁷⁸⁷ CDHS Ref 6: newspaper cutting from *Chatham News* 23 April 1982

⁷⁸⁸ Hansard, Commons, 11 May 1982 vol 23 cc 247-8W

removed from Care but as he had not been wearing respiratory equipment, he had inhaled significant quantities of the isotope Cobalt-60.

The incident was reported to the Factory Inspectorate, which conducted an investigation. The Dockyard's own report implicated Care and the nuclear inspector for not observing the correct procedure. According to the report the work was covered by Nuclear Ship Procedure No. 190, which Care had with him while undertaking the work. In working without the vacuum running he was in contravention of this procedure.⁷⁸⁹ The report also compared Care's actions with those of fitter William Morgan, who had worked on this task and who had overcome the problem of the distorted glove by working for two minutes at a time, stopping the extractor and letting the vacuum level drop to zero before starting again. These actions did not cause significant leakage of radioactive particles into the workspace.

It was acknowledged that the equipment did not work well and that adjustments needed to be made. The Dockyard also committed to trialling new equipment on a test rig before use and that the rig should also be used to train supervisors and operators in using the equipment. Communication issues were also highlighted as a cause of the incident. The duty inspector of health physics monitors, Mr Driscoll; technical supervisor of engine fitters, Mr Harriat; reactor compartment administrator, Mr Milton of Nuclear Standards Branch and health physics monitor, H Cahill, were all variously informed about the task. Mr Driscoll stated that he was not made aware by Mr Harriat that work that would produce an airborne radiation hazard was to be undertaken. The Dockyard ruled, however, that:

... the very mention of work inside a primary component should have alerted Mr Driscoll to probe further into the possibilities of airborne contamination. Health Physics are the experts in protection of personnel and must be expected to be able to spot potential hazards where others cannot.⁷⁹⁰

Having clearly defined the role of Health Physics, the report did acknowledge the difficulty that faced HP monitors struggling to oversee every job that could potentially create a radiation hazard during a refit, without sufficient information. It was, therefore,

⁷⁸⁹ NA, LAB 14/2513: *Notice requiring the making of approved arrangements* Dockyard report submitted to HM Inspector of Factories Rochester Division 14 September 1970: *Report of a Radiation Incident which occurred to John Alan Care, Fitter while working in HMS Valiant on 25th July 1970*, p3.

⁷⁹⁰ LAB 14/2513 *Report of a Radiation Incident which occurred to John Alan Care*, p3.

recommended that communications between junior health physics officers and line management be improved and formalised.

Milton did not escape blame. Although it was acknowledged that his primary responsibility was to the reactor plant rather than personnel, it was felt that his nine weeks of training at Greenwich and experience of nuclear work could have been of use in resolving the problems with the glove box and in advising Care. Procedures were to be amended to clarify the responsibilities of the reactor compartment administrators. It was also noted that Milton was 'stretched to the limit' covering two jobs at the same time.

In a letter from the Institute of Naval Medicine (INM) it was revealed that when Care underwent a scan 24 hours after the incident, he was found to have contaminated lungs, liver and intestines. The estimates of radiation dose that Care received were not possible at the time of the INM letter, despite this the INM concluded 'that the whole body dose will be small, and individual organ doses not above ICRP maximum permissible except for the lungs'.⁷⁹¹ Care was suspended from further work in the Nuclear Reactor and an entry was made in the Health Register on 27 July 1970. The report made the following statements in summary:

The direct cause of the incident was the failure of Mr. Care to follow the authorised procedure Section F, Step 29.

The design of the glove box rig was unsatisfactory for the conditions under which it was used in HMS VALIANT and it was not properly proved on a training rig.

The Fitter concerned did not use the glove box in accordance with the procedure laid down, but his training for this task was inadequate. Neither the Reactor Compartment Administrator, nor the Health Physics Monitor noticed this departure from procedure.

Production Department junior management are short both on numbers and require more training in nuclear work and Health Physics precautions.

This job was under Health Physics control. The Monitor concerned should have been fully informed of the use of the glove box, should have made sure it was properly used and told the Fitter to cease work if it was not. He should also have used a Portable Air Sampler in the tent. This however, would take about 30-40 minutes to give a result and would not have reduced Mr. Care's ingested dose by much.

⁷⁹¹ LAB 14/2513 *Report of a Radiation Incident which occurred to John Alan Care*, p4.

The Monitor concerned, however, had not received sufficient instructions and he was also stretched to the limit trying to cover both jobs.

The identified gaps in training and acknowledgement of the staff shortages contained within the report reflect the evidence from other sources.

Radiation-linked Cancer and Dockyard Workers

The Next To Go

I saw Old Jack the other day,
About ten years I'd been away.
His hair was grey, his body thin,
It didn't really look like him.
He told me all about Old Fred,
How he'd got ill, how he's dead.
The thing is see, I didn't know,
I wasn't there to see him go.
We'd been such mates, had such a laugh,
All pissed up and acting daft.
Down 'The Gills' or up 'The Pav',
What a crack we used to have.
There'd been four of us back then,
Jack and Fred and me and Ben.
We all did our time down at the 'Yard,'
The money weren't much, but the work wasn't hard.
There was always the nuclear allowance and that,
To make sure your new baby could have a new hat.
Nobody told us the work might cost lives,
Leave our children fatherless, make widows of our wives.
And where there were four of us, there's only three,
Who'll be next to go Jack, Ben or me?⁷⁹²

Thomas Henry Wright, former Chatham Dockyard worker

Between four and five years after the Dockyard closed, some former workers, both classified and unclassified, who worked on SSNs began to be diagnosed with cancer. In 2002, the CCDRW printed a Roll of Honour that listed 15 men who had died of cancer

⁷⁹² T. H. Wright *The Next To Go* Campaign for Chatham Dockyard Radiation Workers Newsletter, August 2002, p2.

believed to be linked to their work in the Nuclear Complex.⁷⁹³ Other cases were highlighted in the local press and the BBC Panorama programme *The Price of Peace*, during which it stated ‘Former nuclear workers in the yard were contracting cancers. Soon there were thirty of them. It seemed like an epidemic.’⁷⁹⁴ Cases found during this study total 19. Specific details were not available for most of them. From the information that has been reviewed, there were three cases of skin cancer, one sarcoma, one case of leukaemia, one case of non-Hodgkins lymphoma and one of cancer of the bladder. Four victims were known to be under the age of 37, supporting the belief that exposure is more dangerous for the younger worker. The trades affected were varied: fitters, fitter and turners; an electrical fitter, a boilermaker and a painter. They were also all male. In fact, no cases of RIC among female industrial workers were found. As mentioned in relation to the lack of cases of ARDs among women, this can be attributed in part to the fact that women remained in the minority in the industrial grades that would have been employed in the Nuclear Complex. Moreover, while it is clear that a few women, like ships’ cleaners Anita Tomsett and Miriam Ebdon, did work on the nuclear submarines, it appears that they were not assigned to tasks near the reactor or in radiation hotspots.⁷⁹⁵ No official instruction was found to suggest that women were prohibited from working in these areas, but an article in *Periscope* in 1980 stated that a party of female office workers who were given a tour of HMS *Warspite*’s reactor compartment, were the first women to have been allowed in these areas of nuclear submarines.⁷⁹⁶ The exclusion of women from the high radiation areas of the submarines could be a consequence of the reduced MPD that women were allowed to receive by law; where the Ionizing Radiations (Sealed Sources) Regulations, 1969, permitted men to be exposed to up to 3 rems per calendar quarter, women were legally only allowed to be exposed to a maximum 1.3 rems (1 rem if pregnant). Female workers may not, therefore, have been subjected to the high levels that some male workers had and which are believed to have caused their malignancies. There is little evidence to enable a firm conclusion to be drawn, but one can look to private industry for some comparison. In

⁷⁹³ CCDRW *Annual Report 2001-2002*.

⁷⁹⁴ BBC Panorama *The Price of Peace*.

⁷⁹⁵ A photograph of the two women when they were employed to clean HMS *Churchill* was printed on page 7 of the 8 November 1981 issue of *Periscope*.

⁷⁹⁶ *Periscope* May 1980, p2. The women were named: Chris Chesire, Trisha Martin, Bernice Fisher, Sally Salmon, Flora Allen and Eileen Hobbs.

the US in the early 1940s, the DuPont Corporation did not envisage employing female plant operators ‘because they feared genetic damage to women of childbearing age’. When women were hired, it was to chemical processing roles, where they would distil irradiated uranium into plutonium and which were erroneously believed to be less hazardous than work on nuclear reactors.⁷⁹⁷

The man now suffering from cancer of the bladder, was promoted to work on the refuelling of nuclear submarines in 1976; he was a classified worker. His was the only case of cancer among the nine respondents to the radiation questionnaire and he was also one of only two respondents who recalled being exposed to radiation above the MPD, though he stated that his dose record showed that he received less than 45 mSv per annum.⁷⁹⁸ The other case of overexposure occurred in an HP monitor, whose duty inspector authorised the extra dose. He also went through the decontamination process but did not state whether this was for the same instance.⁷⁹⁹ Four respondents knew someone who had suffered from cancer believed to be radiation-induced and two recalled the cases publicised by the local press, including those of Tim Robson and David Spriggs. Other names mentioned were Terry Deadman, Colin Thomas and Cyril Deadman.⁸⁰⁰ Of the six monitors in one HP team, an anonymous worker recalled: ‘one died, 1 committed suicide and two others, still alive have some form of carcinoma’. He concluded: ‘So, here I am at 72 waiting for the sword of Damocles to drop’.⁸⁰¹

Tim Robson, former boilermaker, volunteered to work on the refit of an SSN in 1977. The *Evening Post* stated that the name of the submarine was HMS *Churchill*. This particular vessel was on tour at this time, having completed its first refit and reactor refuel at Chatham Dockyard in October 1975 and did not return to the Dockyard for refit until 1980. It is more likely that Robson was working on HMS *Conqueror*, which was in the Dockyard for its first refit and reactor refuel between October 1975 and June 1977 or HMS *Courageous*, which was in the Dockyard, also for its first refit and reactor refuel, between November 1976 and July 1978 (see table 6.1):

⁷⁹⁷ K. Brown *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (Oxford: OUP, 2013), p46.

⁷⁹⁸ Questionnaire NR9.

⁷⁹⁹ Questionnaire NR11.

⁸⁰⁰ Questionnaires NR5 and NR11.

⁸⁰¹ Letter from source who wished to remain anonymous.

They were asking for volunteers so I agreed ... The money was better than what I usually got. I received £50 a week for working on a frigate, and £100 a week for working on a [nuclear] sub. As a young man hoping to start a family I thought it was a good idea to volunteer. The extra money was a lot then.⁸⁰²

Although scheduled to work for six weeks on the SSN, Robson received 50 mSv in half that time. According to the *Chatham News*, he stated that ‘advice on what doses were safe was changed to fit circumstances, so that men would continue to work near reactors’ and that the ‘reassurances the men were given proved confusing’.⁸⁰³ Robson was told that exceeding the MPD should not concern him, because another guideline stated that workers could receive three Rads (30 mSv) per quarter; a doctor from the HP department advised him that he could receive a further 3 Rads (30 mSv); and he was also advised that ‘he was all right provided he did not exceed his lifetime dose’. As Robson had started working with nuclear radiation at the age of 20, he took this to mean that he had two years’ dosage ‘in the bank’.⁸⁰⁴ These various advices seem to have been extrapolated from the ICRP’s 1958 recommendation that a limit of 30 mSv per quarter be observed, with an added age-related limit that reduced the average MPD to 50 mSv per annum in a lifetime dose. This was based on the BEAR/MRC 1956 reports, which advised that ‘all workers should be limited to an accumulated exposure of 50 rems (500 mSv) up to the age of 30, and another 50 rems between ages 30 and 40’, which equated to 5 rems or 50 mSv per annum during a working life began at the age of 20. Even before 1977, the advice given to Robson would have been misleading. In being exposed to 50 mSv in the short time that he worked on HMS *Churchill*, he had exceeded the recommended limit by the age of 30; as an ASW he had also exceeded the limit of 13 mSv for a non-classified worker. What’s more, from 1977, the ICRP’s ALARA principle should also have alerted his advisers that his exposure should be justified and minimised. The Defence Committee’s *Twelfth Report on Radiological Protection of Service and Civilian Personnel* in 1990 demonstrates that the MoD was aware of the ICRP and national recommendations for radiological protection. If Robson’s statements were true, something was seriously wrong in the HP department; workers were either being knowingly misled, or the knowledge of the health physicists and HP Monitors

⁸⁰² *Evening Post*, 25 October 1991, p9.

⁸⁰³ *Chatham News* 26 October 1990, p1.

⁸⁰⁴ *Chatham News* 26 October 1990, p1.

was seriously lacking. Robson's dose records showed that he had been overexposed; his wife Linda provided the following comments in *The Price of Peace*:

I do have Tim's radiation records. The MOD did provide them to him during his lifetime. It's quite disconcerting when you look at them because he only worked in the nuclear complex for three quarters of a year and during two of those quarters he was actually over-exposed. The records state themselves that his dose limits were exceeded.⁸⁰⁵

In 1990, Robson was a councillor for the City of Rochester-upon-Medway and he also became Labour's prospective Parliamentary candidate for Mid-Kent. He had also been campaigning with the CDRW since 1989. In 1991 he was diagnosed with non-Hodgkins lymphoma, a cancer of the lymphatic system and he lost his fight against the disease in 1994, aged 39. He believed his condition was due to his work on SSNs.

David Spriggs, former fitter and turner, was exposed to radioactive water while working on a refit of HMS *Dreadnought*. According to his widow, Melanie Nicholson:

He was working in the nuclear base above his head on some pipes which were carrying radioactive water and while he was tightening up a nut the pipe broke and he was covered in water. At the end of his shift he was showered but lights went off and an alarm went off and he was told that it wasn't good enough. He'd have to shower again. And he showered several times and then they measured him with, I think it was a Geiger counter, and said to him that he wouldn't be allowed back into the nuclear base for at least another six months because of the accident that had happened to him.⁸⁰⁶

Spriggs was not a classified worker and when his widow tried to obtain his records in order to progress a claim, the MoD could not find any for him. Ian Baker, a lawyer acting on behalf of Nicholson, was told by the treasury solicitor that 'so far as the Ministry of Defence were concerned this meant that he could not possibly have worked in the reactor compartment on any nuclear submarine and therefore there simply was no case to answer'.⁸⁰⁷ Baker subsequently found a witness to the incident involving Spriggs. Sansom recalled:

⁸⁰⁵ *Price of Peace*.

⁸⁰⁶ *Price of Peace*.

⁸⁰⁷ *Price of Peace*.

All of a sudden I heard this water come gushing out of a valve or whatever it is on the bulkhead that we were working on and I heard this guy swearing his head off. He went ballistic. And when he come up through the level he was red in the face with temper. And you could see it was soaking wet all down him. And they just laughed. They just thought it was one big joke. And I looked at my mate and I couldn't believe that their attitude was oh don't worry, he's only got wet. We'll soon sort you out. And the monitor that was with us that day turned round and he said "Look, I'll have to leave you lads. I can't show you the rest of the reactor. I'll have to take this bloke up and get him decontaminated and that." And even then when we went up that afternoon and after about a period of what half an hour we was down there, we went up and they were still trying to scrub this bloke in the shower. They were scrubbing him to get the radiation level down and he must have been in there a good hour scrubbing him down.⁸⁰⁸

Spriggs subsequently suffered from cancer of the back, spine and liver and died in February 1995 at the age of 38; he believed his cancer to have been caused by his exposure.

Another case that received media attention was that of Rudolph (Rudi) Molinari, former fitter and turner from 1960 to 1983. He remains the only victim of RIC from Chatham Dockyard to have been awarded damages by the MoD. He worked on SSNs for nine years and his radiation record showed a total exposure of 307 mSv, which did not exceed the current dose limits of the time. In 1990, at the age of 36, he was diagnosed with leukaemia. The MoD admitted that his condition was caused by exposure to radiation during his work at the Dockyard and admitted breach of its duty, under section 7 of the Nuclear Installations Act 1965, to ensure that no person be caused any injury as the result of an occurrence involving nuclear matter.⁸⁰⁹ Consequently, the MoD was found liable even though it did not admit to being at fault. Molinari was awarded £165,594 in damages.⁸¹⁰ Although a court report is available, it does not reveal much about the conditions that Molinari worked in, as his solicitor did not need to prove negligence. Rather it goes into great detail about the way he and his family suffered as a result of the leukaemia in order to make the damages case.

The CCDRW was founded by a group of former Chatham Dockyard fitters in 1989, including Deadman; their campaign was launched with a press conference from Molinari's

⁸⁰⁸ *Price of Peace*.

⁸⁰⁹ Molinari v Ministry Of Defence, Queen's Bench Division, 6 December 1993 P.I.Q.R. Q33 at Westlaw: <http://login.westlaw.co.uk/maf/wluk/app/document?src=doc&linktype=ref&&context=8&crumb-action=replace&docguid=IBCBFB6F1E44811DA8D70A0E70A78ED65>

⁸¹⁰ Molinari v Ministry Of Defence

hospital bedside.⁸¹¹ It was formally inaugurated in 1998. It placed pressure on the MoD to acknowledge that cancer in former Dockyard workers may have been caused by their exposure to radiation. Following pressure from the trade union side and CCDRW, the MoD joined the British Nuclear Fuel Industry's Compensation Scheme for Radiation Linked Diseases in July 1994. The scheme provides an alternative to legal action at no cost to the claimant and covers cataracts as well as malignant disease. This no fault scheme has obvious benefits for the MoD, including less publicity. The MoD makes it sound preferable for the claimant too:

Cases considered under the Compensation Scheme are assessed by the application of jointly agreed criteria, which are more generous than legal action. The scheme contains an additional benefit in that it awards payments for cases with a causation probability of 20% or more, whereas in a court case claimants must prove their case on "the balance of probabilities" (that is causation must be shown to be 50% or greater). It has the added advantage that the claimant incurs no cost, does not need a solicitor and cases are dealt with more quickly and with less trauma than through the courts.⁸¹²

While this may make persuasive reading for the potential claimant, particularly if they are undergoing stressful and debilitating cancer treatment, the MoD/AWE progress report for 2012 states that in its 18 years of operation it had received 352 eligible cases, of which just 17 qualified for compensation and were settled. Whether any of these cases related to Chatham Dockyard workers is not stated. The report also made reference to delays in processing claims, which were apparently due to the time it took to retrieve claimants' work records.⁸¹³ This issue was raised at least ten years previously by the CCDRW, which reported long delays with claims submitted by former Chatham Dockyard radiation workers:

Claims have now taken some five years to progress through the so called 'fast track' compensation scheme, and do not comply with the information previously given by MoD representative, Dr Connor, that the Scheme aimed to process all cases within twelve months.⁸¹⁴

⁸¹¹ *Chatham News* 26 October 1990, p1.

⁸¹² MoD *Compensation scheme for radiation linked diseases* 30 June 2000, p1.

⁸¹³ MoD/AWE Compensation Scheme Management Board *Progress Report to the Compensation Scheme Council* November 2012 (http://www.csrlid.org.uk/html/mod_awe.php).

⁸¹⁴ CCDRW *Annual Report 2001-2002*, p2.

As with ARD claims, the MoD resisted providing detailed statistics for claims from radiation workers. In 1994, the *Medway News* reported that there had been nine claims for compensation to the MoD since 1978.⁸¹⁵ In 1997, Spellar answered a question from Shaw on claims received from Chatham Dockyard workers. He explained that since 23 October 1986 40 claims had been received by his department. He also mentioned that since the MoD had joined the BNFL No Fault Compensation Scheme, 32 claims had been submitted, seven of which were rejected as ineligible and 25 were under consideration.⁸¹⁶

In 1997 a health counselling scheme was set up by the MoD, which was open to radiation workers and their families to discuss concerns about the health effects of exposure to radiation.⁸¹⁷ Initially this had been resisted because the MoD did not think that sufficient people would be affected to make use of such a scheme. Certainly attitudes to it were mixed and one former worker, Sansom, commented:

Counselling is cheap. It's all talk. I would like to see something like a proper medical being done, tests being done, to say to me, to convince me that I hadn't got it.⁸¹⁸

Former radiation workers were able to use the counselling scheme to obtain copies of their dose records. Initially this was a victory for former workers, especially those who wished to make a claim. It quickly became clear, however, that there were significant gaps in the records kept. In December 1997, Shaw revealed the contents of a letter from Spellar, which admitted that records could not be traced for 32 former Chatham Dockyard radiation workers who had applied for them through the counselling scheme.⁸¹⁹

Well of course there were two categories of workers in the dockyards – the regular workers and also those who only worked in there occasionally – and for most of the regular workers we do have well-established records. In some cases there are some gaps I have to say and what we're doing is spending something like 1.1 million

⁸¹⁵ *Medway News* 16 September 1994, p9.

⁸¹⁶ Hansard (Commons) *Chatham Dockyard* 28 November 1997 v301 c694W.

⁸¹⁷ MoD *Compensation scheme for radiation linked diseases*, p2.

⁸¹⁸ BBC Panorama *The Price of Peace*.

⁸¹⁹ *Kent Today* 10 December 1997, p5.

pounds on putting all of these on a database so that we're completely aware wherever possible of people's records.⁸²⁰

If former workers could not prove that they had worked with SSNs they could not claim in the event that they contracted RIC. Spriggs' case (above) is an example of this. Some loss of records has been attributed to document destruction during the rundown to the Dockyard's closure. Sansom recalled:

Before we left in '83 ... my record card of the radiation and all that were on a stack, on a rack, and I turned round and said to the guy before I left, I said "Is that meant to go away with all the other records, to keep the record of radiation levels I've actually got here so when I go on it's on my card?" And he turned round and said "Oh don't worry about that." He said "They're all going to get thrown away." He said "Like the rest of the paperwork it's just going to get burnt over at St. Mary's Island so I wouldn't worry about it. You can take it home if you want it."⁸²¹

Other losses were due to human error while the Dockyard was still operational. One fitter, who was involved in the incident on HMS *Courageous* in 1979, lost his film badge during that job. Some eight months later, it was recovered from among the pipes and processed on 7 October 1980. The length of time that the badge was exposed to radiation was, therefore, much longer than the exposure of the fitter concerned. Moreover, it is possible that the fitter gained higher levels of radiation while working without the badge. Once it was finally exposed, the dose recorded on the badge was treated as a technical over exposure.⁸²² Unfortunately, without access to the incident report itself, it is not possible to ascertain whether this man continued to work without his badge or whether he obtained a new one.

As mentioned, in 1999, the MoD released incident reports for Chatham Dockyard, in the period 1968 to 1983. The CCDRW was provided with copies, which it had been trying to obtain for some five years. The reports were used to assist former workers suffering from suspected RICs to build claims against the MoD.⁸²³ Foreman stated that 'there are references throughout [the incident reports], concerning the perceived need for better training and awareness amongst staff'.⁸²⁴ He concluded that serious management

⁸²⁰ BBC Panorama *The Price of Peace*.

⁸²¹ BBC Panorama *The Price of Peace*.

⁸²² Letter from Thomas Foreman, 22 January 2013, p3.

⁸²³ CCDRW Annual Report 2001-2002, p2.

⁸²⁴ CCDRW *Introduction*, p1.

failures occurred, including failure to follow HP monitoring and safety standards, overlooking of standard procedures and circumvention of regulations.⁸²⁵ Failure of NDT radiation monitoring equipment and safety procedures and undue radiation exposure to people working near the primary coolant pipework were also mentioned.

Conclusion

The health risks of high levels of ionising radiation were clear from very early research and use. The Radioactive Substances Act 1948 covered the industrial radiography work of the Dockyards almost from the commencement of this type of work by the Navy, including health and safety provisions. By the time that Chatham Dockyard began refitting nuclear submarines the Nuclear Installations Act 1965 was in force. As has been shown, the MPD was reduced from 150 mSv per annum to 50 mSv per annum prior to the opening of the Nuclear Complex. Since the Dockyard's closure the MoD has imposed even lower limits for its workers and more recently the legal MPD has been set at 15 mSv. These events demonstrate that the levels of radiation that Dockyard workers were exposed to were very high and potentially needlessly so. The latency of the effects of low long term exposure to radiation combined with the fact that large populations of radiation workers did not start to be employed until the 1940s and 1950s has contributed to a high level of uncertainty surrounding the impact of this kind of exposure. To date much uncertainty still remains; however, it is apparent that Chatham Dockyard radiation workers, especially those exposed before the age of 30, have succumbed to RIC.

Again, the radiation risk should not be considered in isolation, but as one of the catalogue of risks that faced the Dockyard worker. It should also be acknowledged that the radiation risk was greater for workers in the reactor compartments of SSNs, particularly those working near hot-spots. The MoD's competing priorities have already been touched upon and it is suggested that the strategic importance of nuclear propulsion and weaponry was in conflict with the need to workers' health. There was certainly no question of cessation in the use of nuclear resources. Indeed, the sources suggest that pressure to complete refits on time actually resulted in safety measures and policies being compromised. Like in the US construction industry, it would appear that two distinct sets of safety rules applied at the Dockyard. Using Paap's terminology, the official safety rules

⁸²⁵ CCDRW *Introduction*, p2.

can be seen in the Admiralty Book of Rules, standing orders, notices and articles in *Periscope*, while the AOPs are alluded to in the testimony of radiation workers quoted in this chapter.⁸²⁶

The evidence set out in this chapter has established that the Admiralty/MoD put in place wide-ranging safeguards against the hazards of radiation to Dockyard workers in line with legislative requirements. It has been difficult to assess how this compared with other nations' navies both due to secrecy surrounding the subject and also the lack of agreement between scientists as to the cause of cancers in Dockyard populations or indeed among wider groups of people. Although Large accused the MoD of being 15 years behind the US Navy in terms of worker exposure, it is not clear on what his assertion is based or whether his comparison was retrospective.⁸²⁷ For the period of this study the MPD adopted by the MoD was the same as that in the US. It could be that in his study of US workers and of UK workers, Large had access to individual dose limits that suggested that actual doses were closer to the 50 mSv limit in the UK than they were in the US. There is certainly evidence in this chapter that shows that at least some Chatham Dockyard workers were receiving doses at the higher end of the MPD, despite ALARA.

The research for this chapter has established that in common with the asbestos threat, a gap existed between the measures introduced to protect workers and workers' knowledge of the risks they faced. Only one of the respondents to the radiation questionnaire believed they did not know about some of the risk that faced them, but other testimony, newspaper articles and commentary on incidents shows that while workers knew that radiation could be dangerous, they did not always understand the extent of the risk or how it would affect them. They often put faith in the HP experts, yet the evidence herein shows that confusion or deliberate deception meant that workers received higher doses than they should have. The problems of recollection and memory in oral history studies must be reiterated, as must the possibility of sensationalism in newspaper articles. Again, the effectiveness of health and safety measures was undermined by poor supervision and misunderstanding. This was compounded by uncertainty about the risks even among the scientific institutions established to develop radiological protection and the political and economic factors that prevented lower dose limits from being imposed sooner.

⁸²⁶ Paap *Working Construction*, p161.

⁸²⁷ *Evening Post* 6 November 1990, p9.

Between 1968 and 1984, measures were taken to reduce the levels of radiation that workers were exposed to with additional shielding and new working practices that reduced the time that workers spent near hot spots. This reduced the risk to workers, but the steps taken to further reduce exposure in the years after the closure demonstrate that more could have been done. Unlike mesothelioma and asbestosis, it is, in many cases, impossible to ascertain whether cancer is directly attributable to radiation rather than to another carcinogen. What is clear is that some former Chatham Dockyard radiation workers contracted cancers and died at quite young ages. Even the MoD admits that 'some individuals who worked in nuclear Dockyards had levels of radiation that were high and have acquired cancers which could possibly be due to radiation'.⁸²⁸ Those being diagnosed in the 1990s and who came to the attention of the CCDRW were overwhelmingly young men in their thirties. Bearing in mind the latency period for RIC and the date of the Dockyard's closure, these men would have been in their twenties and at most risk from chromosome damage when they were working in the Nuclear Complex.

⁸²⁸ BBC News *Government admits nuclear sub cancer link* 25 January 1998
<http://news.bbc.co.uk/1/hi/uk/50497.stm>.

Table 6.1
SSN refitting, refuelling and maintenance work at Chatham Dockyard

Dates	Submarine	Refit work
April 1970 to May 1972	<i>Valiant</i>	First refit and reactor refuel
June 1971 to October 1973	<i>Warspite</i>	First refit and reactor refuel
December 1973 to October 1975	<i>Churchill</i>	First refit and reactor refuel
May 1974 to October 1976	<i>Dreadnought</i>	Second refit, reactor refuel and first decontamination of Primary Loop
October 1975 to June 1977	<i>Conqueror</i>	First refit and reactor refuel
November 1976 to July 1978	<i>Courageous</i>	First refit and reactor refuel
April 1977 to January 1978	<i>Sovereign</i>	Reactor modification
January 1978 to February 1980	<i>Valiant</i>	Second refit and reactor refuel
August 1979 to March 1982	<i>Warspite</i>	Second refit and reactor refuel
October 1980 to May 1983	<i>Churchill</i>	Second refit and reactor refuel
March 1982 to March 1983	<i>Dreadnought</i>	Decommissioning and defuel
Source: Hansard (Commons) WA 26 November 2002 (http://www.publications.parliament.uk/pa/cm200203/cmhansrd/vo021126/text/21126w07.htm).		

Table 6.2			
SSN refitting, refuelling and maintenance work at Chatham Dockyard, including approximate radiation dose levels to workforce			
Years	Submarine	Project	Total Dose Received
1967	VALIANT	DED	*
1968	WARSPITE	DED	*
1968	VALIANT	DED	*
1968-9	VALIANT	DED	*
1969	WARSPITE	DED	*
1969	VALIANT	DED	*
1970	VALIANT	Refit	12 man-Sv
1970	WARSPITE	DED	*
1971-3	WARSPITE	Refit	18 man-Sv
1972	DREADNOUGHT	DED	*
1973	CHURCHILL	DED	*
1973	VALIANT	DED	*
1973	CONQUEROR	DED	*
1974	CHURCHILL	Refit	8 man-Sv
1974	DREADNOUGHT	PPD & Refit	17 man-Sv
1975-7	CONQUEROR	Refit	8 man-Sv
1976-8	COURAGEOUS	Refit	8 man-Sv
1977	SOVEREIGN	Reactor fix	1.5 man-Sv
1977-80	VALIANT	Refit	12 man-Sv
1979	DREADNOUGHT	DED	*
1979-82	WARSPITE	Refit	13 man-Sv
1980	CONQUEROR	DED	*
1980	COURAGEOUS	DED	*
1980-3	CHURCHILL	Refit	6 man-Sv
1981-2	DREADNOUGHT	Decommission	1 man-Sv
(NB: The refit doses are from memory, but are reasonably accurate. Average doses during DEDs were 0.1 man-Sv.)			
Source: <i>HM Dockyard Chatham – Radiation Work</i> supplied by Ronald Brown, DSTL. Author unknown, but believed to be a brain dump from a radiation supervisor at/after Chatham Dockyard's closure.			

Table 6.3
Dose rates from natural and man-made radiation

Source	Dose (mSv/year)
<i>Natural Radiation:</i>	
Local gamma radiation	0.50
Carbon-14	0.01
Radon and decay products	0.04
Potassium-40 in body	0.20
Cosmic radiation	0.50
<i>Man-made Radiation:</i>	
Diagnostic radiology	70.0
Therapeutic radiology	30.0
Use of isotopes in medicine	2.0
Radioactive waste	2.0
Fall-out from nuclear weapons [i.e. testing]	7.0
Occupationally exposed persons	5.0
Other sources	4.0
Source: A. Martin & S. A. Harbison <i>An introduction to Radiation Protection</i> Second Edition (London: Chapman and Hall Ltd., 1979), pp 53 & 57.	

Table 6.4: NRRW 3rd Analysis: Standardised mortality ratios (SMRs) for all malignancies by first employer			
Employer/site	Number of Deaths		SMR
	Observed	Expected	
Atomic Weapons Establishment	884	1028.51	86
British Nuclear Fuels	2651	2945.6	90
Science and Technology Facilities Council	118	151.45	78
MoD (including Navy, Army, RAF & Civilian)	1547	1829.45	85
MoD Civilian	673	774.15	87
Medical Research Council Harwell	8	9.82	82
Health Protection Agency-Radiation Protection Division	3	4.43	68
British Energy and Magnox Generation (England & Wales)	747	919.21	81
GE Healthcare	65	103.63	63
PDS	11	11.66	94
Rolls-Royce Submarines	79	94.61	84
British Energy and Magnox Generation (Scotland)	92	98.32	94
United Kingdom Atomic Energy Authority	1901	2469.65	77

Source: C.R. Muirhead *et al* *Third Analysis of the National Registry for Radiation Workers: Occupational Exposure to Ionising Radiation in Relation to Mortality and Cancer Incidence* (Oxfordshire: Health Protection Agency, 2009), p144.

Table 6.5: Values of maximum permissible occupational exposure recommended by the ICRP, 1950 to 1977	
Dose rate	Date recommended
150 mSv/year or appx. 3 mSv/week	1950
50 mSv/year or appx. 1mSv/week	1956
All exposures to be kept as low as reasonably achievable (ALARA); dose equivalent limit 50 mSv/year.	1977
Source: Martin and Harbison <i>An introduction to Radiation Protection</i> , p60.	

Table 6.6: UK Occupational Whole-body Dose Limits	
1951	0.5 R/week
1955-9	0.3 R/week (200 R in a lifetime, averaging 5 R/year)
1959-77	5(N-18) rem/year (3 rem/13 weeks)
1977- [1990]	50 mSv (5 rem)/year
Note R is the old unit of exposure, the Roentgen, N=age	
Source: Lambert <i>How Safe is Safe</i> , p56. NB there is no direct conversion from Roentgen to rem or Sv.	

Table 6.7: Risks Associated with (a) ordinary life (b) employment	
Risk is defined in terms of the number of deaths that would occur if ten thousand people were exposed to the risk. The figures are based on standard statistical sets.	
(a) Risks associated with normal life	Deaths/10,000 people exposed to risk per year
Home accidents	1.4
Cigarette Smoking (Lung Cancer only)	8
Leukaemia (national)	0.6
All Causes	100
(b) Risks associated with occupations	Deaths/10,000 people exposed to risk per year
Total occupational deaths	2
Constructional Engineers and Erectors	13
Coal Miners	8
Railway Workmen	9
Electrical Supply	1.8
Classified Worker (maximum leukaemia risk)	0.2
Source: HM Naval Base, Chatham, <i>Radiation Safety</i> (January 1973), p15	

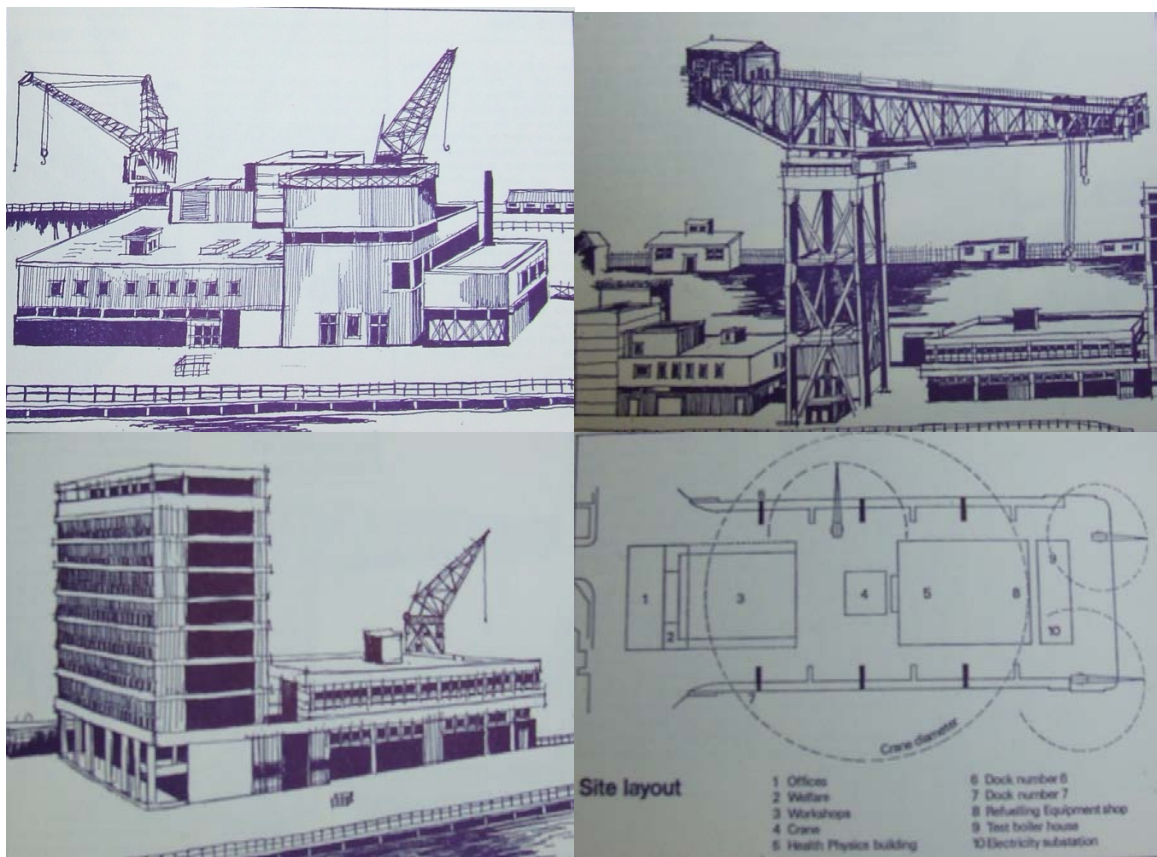


Figure 6.1: The Nuclear Complex (clockwise from top left): Health Physics building; mechanical and electrical facilities; office block and workshop; site layout plan.
 Source: RDL (black and white).



Figure 6.2: Radiographer Peter Harris checking gamma dose meter as a test is carried out at lunchtime on a weld made in the hull of HMS *Warspite*. Danger and radiation warnings are in clear sight.

Source: *Periscope* June 1980 (black and white).



Figure 6.3: Workers in white overalls and cotton hats and gloves undertaking refuelling. The working conditions in this photograph are starkly different from all other images of work in the Dockyard. They are very clean and devoid of debris. Rather than dirty overalls, workers are all dressed in white. Source: RDL 2007.0008.22 PHA 11378 (black and white).



Figure 6.4: Workers in white overalls and cotton hats and gloves during nuclear refit. Note photograph taken through protective polythene. Presumably this was done to prevent any contamination being introduced to the working environment by the photographer.

Source: RDL 2007.0019.38 PHA 12494 (black and white).



Figure 6.5: HMS *Valiant* in No 9 Dock 1 April 1968. Covered walkway to and from the submarine is visible on the right.
Source: RDL 2007.0073.91 PHA 15347 (black and white).



Figure 6.6: HMS *Valiant* entering No 9 Dock 1966. This was prior to completion of the Nuclear Complex. The submarine's visit was for Christmas leave for the crew and routine maintenance. Only a few workers were allowed to welcome the submarine and they are visible on the shore to the left and right. The photograph was published on page 7 of *Periscope* December 1966.
Source: RDL 2007.0112.40 PHA 17596 (black and white).



Figure 6.7: Cartoon emphasizing the clean conditions in which nuclear submarines were refitted and presumably echoing the precision with which much of the task needed to be undertaken. The white coats and cotton hats that workers in the submarine were required to wear were quite reminiscent of surgical scrubs. Source: *Periscope* March 1975, p7.



Figure 6.8: Female office workers from the NUPM Department: Chris Cheshire, Trisha Martin, Bernice Fisher, Sally Salmon, Flora Allen and Eileen Hobbs. They were photographed wearing protective clothing while on a tour of HMS *Warspite*'s reactor compartment in 1980. An article in *Periscope* explained that the women dealt with the paperwork concerning the submarines and were curious to see the submarines themselves. The article also states that their visit was the first time that women had been allowed in the reactor compartment of a nuclear submarine.

Source: RDL ref 2007.0020.85 PHA.12641 and *Periscope* May 1980, p2.

Chapter 7

Conclusion

This study of occupational hazards at Chatham Dockyard revealed a combination of causal factors that contributed to dangerous working conditions. Shipbuilding and ship-repairing were among the most dangerous industries in the period, with accident rates higher than in the construction and manufacturing industries. Moreover, in the naval yards (private and state run) the introduction of nuclear submarine building and refitting further increased the risks. Chatham Dockyard primarily engaged in ship-repairing and refitting activities in the post-1945 period, which were arguably more dusty and dangerous than building new vessels. This was certainly the case with refitting nuclear submarines, which commenced in 1970. While the work itself could be perilous, the following issues increased the risks to workers: competing priorities impacted on the level of protection afforded to workers by the Admiralty/MoD;⁸²⁹ masculine culture among workers increased the risk of succumbing to occupational illness or injury; and where legislation and Admiralty/MoD policy sought to address risks, these efforts were frequently hampered by communication failure, gaps in knowledge and poor management decisions. Further, it would seem that these factors combined reflected Paap's unofficial cultural rules, which encouraged violation of safety regulations, in order that the wider aim, of getting vessels repaired and/or refitted and then back in service. This was particularly pertinent for the nuclear submarines on patrol for Cold War threats.

It was established that the MoD devoted significant energy and funds to research into the impact of asbestos-related disease on its workforce and then to finding alternative materials for shipbuilding and repair. In regard to the asbestos hazard at least, Johnston and McIvor's claim that workers in the Royal Dockyards were better protected than private sector workers was found true.⁸³⁰ Protective measures were introduced for the interim

⁸²⁹ The Admiralty merged with the War Office, Ministry of Aviation and Air Office in 1964 to form the Ministry of Defence.

⁸³⁰ Johnston and McIvor *Lethal Work*, pp91-2.

period during which workers would still be exposed to asbestos in older vessels. Despite these efforts, the study found that some workers remained confused as to the extent of the danger and the recognition of asbestos. There was also evidence to suggest that workers continued to be exposed to harmful fibres into the 1970s and 1980s. These findings confirmed that communication and training were wanting. The enthusiasm with which the asbestos risk was addressed highlighted the lack of initiative expended on the radiation hazard. The contrast between the treatment of these hazards suggested that profit had little to do with how the Dockyards dealt with health and safety issues. While all of the issues mentioned above were apparent during research for this subject, the evidence regarding competing priorities was stronger here than for any other hazard. In contrast to the asbestos hazard, the MoD did little more than keep up with legal requirements until 1989, after Chatham Dockyard closed. In that time, workers in the Nuclear Complex were frequently exposed to levels of radiation that would be considered excessive today. It can be argued that the strategic importance of nuclear propulsion and weaponry accounted for the difference in attitude to the risks it posed to the workforce. Moreover, the time pressures imposed on nuclear submarine refitting combined with shortfall in labour appear to have influenced circumvention of safety protocols by management and by workers in the Nuclear Complex.

Evidence showed a strong masculine culture within the Dockyard. While the negative implications of masculine behaviour traits were acknowledged, including discrimination against female colleagues, the research suggested that certain of these traits may have served as a method for workers to cope with the conditions in which they worked. This would be particularly pertinent where workers witnessed serious injury and death among their colleagues. Paradoxically, masculine culture was also found to increase practices that threatened workers' safety, such as refusal to avail themselves of protective measures where these adversely impacted earning potential. The most prevalent risk-taking appears to have been concentrated in two groups: young apprentices engaging in horseplay and endeavouring to impress their colleagues; and married men with young families, who put their future health at risk in order to earn more in the present. Workers in the Dockyard were patriotic and believed that their work contributed to the defence of the nation, a sentiment that was fostered by launching and commissioning ceremonies and reports in *Periscope* of vessels in service. The study opens a discourse on the history of health

and safety in the Royal Dockyards after 1945 and contributes to the historiographies of the use and impact of asbestos and nuclear power in industry. It also adds to literature in the fields of naval, maritime, labour, gender and medical history, while the testimony collected during the study makes an important contribution to the life history of Chatham Dockyard and builds on existing oral histories of the Royal Dockyards. It provides an in-depth account of working conditions, including examples of accidents and incidents in the period, which reveal management practices and traditions, notably the unquestioning reliance on previous practice. This in turn reflects the hierarchical structure in the Dockyard that precluded questioning of methods and a potential a flaw in the apprenticeship system of training that relied on young workers learning from their skippers through practice and word of mouth; if an apprentice was assigned a skipper who lacked an understanding of why certain methods were used, then that gap in knowledge would certainly have been passed on through successive generations of workers. Management failures appear to have made a significant contribution to the exposure of workers to excessive levels of radiation, with the pressure to turn nuclear submarine refits round in a short time frame with a limited classified workforce. Although the MoD has not admitted fault for the occurrence of cancers in former Dockyard workers, the fact that the most publicised cases involved men who would have worked in the Nuclear Complex in their twenties and the types of malignant disease they contracted, suggests that the cancers were induced by radiation. It is true that few radiation workers were subjected to doses higher than the Maximum Permissible Dose current at the time, but the examples provided in this study show that the ALARA principle did little to reduce the amount of radiation that workers were exposed to at Chatham Dockyard.

Chapter 5 adds to the discourse on the use and impact of asbestos in industry. It supports Tweedale's findings in relation to the efforts expended by Turner & Newall to quash concerns about the health implications of its asbestos products, through examination of the company's correspondence to, and about, the Admiralty and the Dockyards in the period. It also expands on Johnston and McIvor's statement that the Dockyards invested more in terms of protecting asbestos workers than the private sector,⁸³¹ by showing that the Dockyards did more to protect all workers from asbestos than the private sector and were held up in legal cases as an example of what should be done. While this was certainly the

⁸³¹ Johnston and McIvor *Lethal Work*, pp91-2.

case, many workers still succumbed to asbestos-related diseases and the study gives some indication of prevalence by exploring cases involving Chatham Dockyard workers.

Chapter 6 opens a new avenue in the historiography of nuclear power. Not only is it the first time that detailed consideration (outside of the elusive Large report) has been paid to the health and safety implications for Chatham Dockyard workers of this hazard, it is also a rare exploration of the impact of ionising radiation on industrial workers outside of the nuclear power industry. As well as work on refitting and maintaining nuclear submarines, it was found that the Dockyard had been using radiation for non-destructive testing from a much earlier time. This area of work has hitherto received no academic interest.

The study also brings together the relevant secondary sources and supplemented these with information gathered from primary documents and life history sources to provide a brief history of Chatham Dockyard in the post-1945 period. Primary research has added previously unpublished information on the work of the Dockyards and makes a significant contribution to limited historiography of the Dockyards in the period. For example, the section on repayment work in chapter 2 is written exclusively from information obtained through empirical research. Further, the sections on the history of education and medical services in the Dockyard have been enriched and personalised by testimony from former workers.

The study contributes a unique analysis of the masculine culture among Chatham Dockyard workers in the period. It explores the manifestation of masculine behaviour traits and in doing so it adds to the discourse on gender relations in the twentieth century Dockyards started by Day and Bartram and Shobrook.⁸³² While recollections from former electrical fitter Linda Read reflect the comments of female workers from Devonport Dockyard in Bartram and Shobrook's article, the testimony collected from Chatham's male workers adds a different perspective. While there is no question that female industrial workers faced discrimination from their fellow workers, some of the comments made by men in interviews and questionnaires reveal their ignorance of the way in which their behaviour disadvantaged their female colleagues. Some, for example, were at pains to assure me that they were polite to and did not swear in front of the ladies employed in the

⁸³² R. Bartram and S. Shobrook 'You have to be twice as good to be equal: 'placing' women in Plymouth's Devonport Dockyard' *Area* 30:1 (1998); A. Day 'The Forgotten 'Mateys': women workers in Portsmouth Dockyard, England, 1939-45' *Women's History Review* 7:3 (1998).

Dockyard; for Read this added to the feeling of alienation, when her overall desire was to fit in and be accepted for her abilities. Further, the efforts of Dockyard management to publicise the employment of women in male roles generated resentment among some male workers, particularly the male apprentices working with the first female apprentices. Unlike the articles on Portsmouth and Devonport, the current study was not concerned solely with gender relations. As such it further contributes to knowledge through analysis of Dockyard humour (including horseplay), workers' poetry and the giving of nicknames. It also looks at attitudes to harsh conditions and risk-taking. In this respect it adds to the work done by Paap, Iacuone and Johnston and McIvor and others on the manifestation and impact of masculinity on health and safety at work.⁸³³ The information obtained from primary sources confirmed Johnston and McIvor's findings that masculine culture is complex and that it manifests itself in many different ways. Moreover, though generally there were overarching themes of masculine behaviour in the Dockyard, it was apparent that workers did not present masculine behaviour traits in the same way and that individual interpretations of masculinity clearly differed. These conclusions reflect Connell's and Hale's theories in relation to multiple masculinities.⁸³⁴ The thesis also draws parallels with Paap's important work on unofficial and unwritten behaviour codes, which have serious implications for workers' safety. Indeed Paap's work highlights the currency of this subject for understanding workplace culture and the frequent failure of health and safety systems. Sellers and Melling also draw attention to the current relevance of the study of occupational disease, stating that 'Depending on where you stand at present, industrial dangers can be at once new or old, mostly occupational or mostly environmental, unknown or widely recognised'.⁸³⁵ Certainly, asbestos and ionising radiation still present risks today and any study that enhances understanding of how these hazards manifested themselves in the past has potential significance for workers today, particularly in industrialising nations.

⁸³³ Paap *Working Construction*; D. Iacuone ' "Real Men Are Tough Guys": Hegemonic Masculinity and Safety in the Construction Industry' *The Journal of Men's Studies* 13:2 (2005); R. Johnston and A. McIvor 'Dangerous Work, Hard Men and Broken Bodies: Masculinity in the Clydeside Heavy Industries' *Labour History Review* 69:2 (August 2004).

⁸³⁴ R. W. Connell *The Men And The Boys* (Cambridge: Polity Press, 2000), p10; Hale 'The Role of Practice in the Development of Military Masculinities' *Gender, Work & Organisaztion* doi: 10.1111/j.1468-0432.2010.00542.x, p5.

⁸³⁵ C. Sellers and J. Melling 'From Dangerous Trades to Trade in Dangers: Toward an Industrial Hazard History of the Present' in Sellers and Melling *Dangerous Trade*, p1.

The testimony collected during this study makes an important contribution to the life history of the Dockyard. Combined with primary documents and comparative material from secondary sources, it provides a comprehensive account of the manifestation, management and impact of occupational hazards on Dockyard workers. It builds on the oral histories of the Dockyards compiled by Waters, Day and Pritchard and others through interviews and group discussions with former workers, both male and female, from various roles including industrial trades and clerical jobs,⁸³⁶ reducing the gap in terms of the recollections of workers in the post-1945 period, particularly in relation to Chatham Dockyard workers. Testimony was also obtained through questionnaires, with an initial questionnaire that generated 65 responses and covered a range of topics relevant to the post-1945 history of the Dockyard. These topics included work experiences, culture, social and technological change, and the impact of the Dockyard's closure. As the subject of the thesis evolved, two further questionnaires were sent out to a much more limited number of people. These covered the asbestos and radiation hazards and made in-depth inquiries as to the appreciation of the hazards and their impact on workers. The testimony relating to asbestos adds to Johnston and McIvor's work in this area, which included interviews with former Clydeside workers. Indeed, the life history sources consulted during this study include familiar references, such as asbestos 'snow ball' fights among unaware workers.⁸³⁷ The testimony collected will be deposited with the Royal Dockyard Library, once satisfactory arrangements have been made for its secure storage. Requests for anonymity will be honoured during this process.

Many of the issues in workplace safety that arose in Chatham Dockyard between 1945 and 1984 are still relevant today. The Health and Safety Executive (HSE) is still running a campaign to inform workers about the dangers of asbestos, albeit the focus today is predominantly on the construction trade and on independent contractors who may come across the material while working in commercial and domestic buildings.⁸³⁸ Workers' behaviour and complacency also remain problematic and the HSE first published guidance,

⁸³⁶ A. Day and G. Pritchard *Staying Afloat: Recollections of Portsmouth Dockyard 1950-present day* (University of Portsmouth, 1999); M. Waters *A Social History of the Chatham Dockyard Workforce* (PhD thesis) (University of Essex, 1979); A. Day 'The Forgotten 'Mateys': women workers in Portsmouth Dockyard, England, 1939-45' *Women's History Review* 7:3 (1998); J. Stanton *The Last Cast Off* (AIM Publications: Gillingham, Kent, 1990).

⁸³⁷ Johnston and McIvor *Lethal Work*, p96;

⁸³⁸ See: www.hse.gov.uk.

regarding the human factors that companies ought to consider in order to mitigate health and safety risks, in 1989. In the most recent incarnation of this guidance, the following comments are made about the perception of human error as the sole cause of accidents:

Over the last 20 years we have learnt much more about the origins of human failure. We can now challenge the commonly held belief that incidents and accidents are the result of a 'human error' by a worker in the 'front line'. Attributing incidents to 'human error' has often been seen as a sufficient explanation in itself and something which is beyond the control of managers. This view is no longer acceptable to society as a whole. Organisations must recognise that they need to consider human factors as a distinct element which must be recognised, assessed and managed effectively in order to control risks.⁸³⁹

While it is acknowledged that the industrial landscape has changed immeasurably in the years since the closure of Chatham Dockyard and that social and political changes mean that the context today is much different, the persistence of some health and safety issues suggest that there is still something to be learned from studying the history of occupational injury and disease.

As is often the case with such projects, as many questions were raised by the study as it sought to answer. In some cases these were investigated further and incorporated into the research. It is hoped that the study will influence further research into the working conditions and health and safety in the Dockyards. Specifically, more detailed research into the causes of death of Dockyard employees would be beneficial in terms of assessing the full impact of occupational accident and disease on the workforce. Such a study could take into account deaths caused by conditions that can be brought on by asbestosis, for example, but which may not necessarily have been linked to the disease at the time of death. This study has also considered other hazards present in the Dockyards, many of which would benefit from study in their own right. Industrial deafness and the risks introduced by welding are just two examples.

Heller argues that 'the study of company magazines should be located in a much wider field of historical literature, which encompasses ... the history of industrial welfare'.⁸⁴⁰ While this study has not concentrated specifically on the role or use of the

⁸³⁹ HSE *Reducing Error and Influencing Behaviour* (HMSO, 2009), p9.

⁸⁴⁰ M. Heller 'Company Magazines 1880-1940: An Overview' *Management & Organizational History* 3:3-4 (2008), p179.

Dockyard newspaper, it has provided examples of its use in education and informing the workforce. It has also provided examples to support Heller's findings in relation to the efficacy of company magazines in engendering a safety culture within the workplace. The Dockyard newspapers are a valuable source and their introduction and use warrant further study.

The title of this thesis was chosen from the testimony of a former smith (quoted in chapter 3). The statement sparked interest because it alluded to the masculine trait of suffering hardships without complaining. It conjured an image of the men and women employed in the Dockyard as poor, meek servants of the Crown subjected to intolerable conditions and suffering them quietly, as they got on with their work. Yet documents and testimony considered for this study were peppered with examples of Dockyard workers speaking out against their conditions, especially where they felt that recompense was due. The evidence herein finds that the confidence and eloquence that Waters identified in nineteenth century workers in Chatham Dockyard lived on in successive generations.⁸⁴¹

Despite the expenditure cuts and reductions in manpower that characterised the Royal Navy and its support services after 1945, Chatham Dockyard remained a significant employer in the Medway region. Its closure in 1984 entailed the loss of some 7,000 jobs and brought an end to a relationship with the British state that had defined and shaped the economy, society and culture of the locality for over 400 years. But the Dockyard has left a legacy of occupational injury and disease that is still afflicting former workers and their families 30 years on. Moreover, recent newspaper reports suggest that similar problems still impact the health and safety of naval personnel and civilian workers in the UK. In 2013, the *Mail on Sunday* claimed to have revealed that the now aging Trafalgar class submarines had 'leaking and cracked reactors and a lack of trained staff'. The perceived need for a nuclear deterrent ensures that these vessels are kept operational until the vessels of the Astute class are ready to replace them. Meanwhile they represent a serious risk to all those working with them.⁸⁴²

⁸⁴¹ M. Waters 'The Dockyardmen Speak Out: Petition and Tradition in Chatham Dockyard, 1860-1906' in Lunn and Day *History of Work & Labour Relations in the Royal Dockyards* (Mansell Publishing Limited: London, 1999).

⁸⁴² *Mail on Sunday* 4 August 2013, p17.

Appendices

Appendix 1

Former Chatham Dockyard workers who participated in the study

Interviewees

Adams	Smith	
Blackman	Bob	Shipwright
Brown	Stan	
Cowley	Norah	Senior personal secretary
Dawson	Joe	
Foster	Mick	
Goodwin	Dennis G.	Patternmaker
Harfleet	Ron	Shipwright/recorder
Hargrave	Peter 'Derek'	Shipwright/analytical estimator
Jenkins	Brian	Engine fitter/recorder
Lewing	Philip	Fitter and turner
Nutting	Victor	Fitter/driller
Read	Linda	Electrical fitter
Sargent	Joyce	
Scott	Nigel	
Sullivan	Ron	Shipwright
Wright	Frank	

Discussion groups

Blackman	Bob	Shipwright
Evans	David (Dai)	Electrical fitter
Gifford	Norman	Shipwright apprentice
Harfleet	Ron	Shipwright/recorder
Court	Chris	
Rayner	Alan	Shipwright
Dawson	Peter	Yard boy/pattern maker
Dawson	Rita	Wages clerk
Pynn	Eddie	
Sullivan	Ron	Shipwright
Atkinson	John	Boilermaker/foreman's writer/progressman technical
Bridges	Brian	Boilermaker
Salmon	Cedric	Senior Draughtsman
Steer	Henry	Electrical Engineer
Yeates	Keith	Joiner
Easdown	Andrew	Technician apprentice (hull)
Elmer	John	
Fullman	William	Draughtsman
Jones	Kevin	
Sharman	Brian	

Tumber David Shipwright

Questionnaire respondents

Adams	Smith	Shipwright PTO
Allard	Christopher	Shipwright
Andrews	Christopher	Electrical
Applegate	Richard	Electrical diagnostician PTO IV
Ashford	Brian	Electrical fitter
Bayliss	John Robert	Electrical Fitter
Bird	Paul	Electrical fitter
Botley	George	Boilermaker apprentice
Bradley	Donald	Shipwright
Carrick	Jeanette	Woman police constable
Chapman	Elizabeth Ann	Clerical Assistant
Chapman	Fred	Apprentice plumber
Chitticks	Mr B B	Electrical
Cocup	Raymond	Electrical
Collins	Paul	Motor vehicle fitter
Colyer	Mark	Seaman
Dawson	Peter	Yard boy/pattern maker
Dean	Derek	Shipwright
Downs	Robin	Painter
Duffort	Ray	Slinger
Eddowes	Richard	Shipwright/foreman of the yard
Edwards	Paul	Boilermaker
Feist	Ivor	Engine fitter
Fridd	A.D	Fitter and turner apprentice
Gifford	Norman	Shipwright apprentice
Godfrey	A.C.	PTO III
Goodwin	Dennis G.	Patternmaker
Gregory	Stuart	Electrical technician
Gutteridge	E.F.	Joiner
Hall	Dudley	Shipwright
Harfleet	Ron	Shipwright/recorder
Hargrave	Peter 'Derek'	Shipwright/analytical estimator
Harris	Thomas A	Shipwright
Harris	Peter	Armament turner and fitter
Jenkins	Brian	Engine fitter/recorder
Lane	Russell	Mechanical technician apprentice
Lewing	Philip	Fitter and turner
Mallion	Mary	Civil servant
Manklow	John	Electrical
Matthias	June Pamela	Tracer/drawing office assistant
Matthias	R.W	Storehouseman
Miller	Gary	Painter
Moore	Colin	Boilermaker
Mullett	Reg	Blacksmith
Nutting	Victor	Fitter/driller
Nye	Raymond	Shipwright
Parr	Andrew	Joiner
Plum	Ron	Joiner/Draftsman
Pulling	Leslie	Inspector of labourers

Rayner	Alan	Shipwright
Smith	Paul	Electrical Fitter
Stacey	Peter	Shipwright/draughtsman
Stanley	Clive	Engine fitter and turner/draughtsman
Steer	Henry	Electrical Engineer
Stevenson	Edwin	Shipwright
Still	C R	Shipfitter
Taylor	Barbara Anne	Clerical officer in Nuclear Complex
Taylor	Mrs V	VDU operator (punch card operator)
Thompson	Brian	Shipwright
Tring	Roger	PTO mechanical draughtsman
Walsh	Colin	Health physics monitor
Wiles	Ann Margaret	Shorthand/typist
Willer	Peter	A/B RMAS (Dockyard Tugs)
Williams	Susan	Machine operator
Wright	Frank	

Other

Beswick	Tom	Tug man
Bond	Joe	Engine fitter
Nye	Mavis	

Appendix 2

Questions asked in initial questionnaire:

Brief details of your career in the Yard

Year joined the Yard:

Age when joined:

Year left the Yard:

Trade/occupation:

Did you complete an apprenticeship? YES/NO

Were you Established? YES/NO

Were you a hired worker? YES/NO

Were you married when you joined the Yard? YES/NO

Were you married during your career in the Yard? YES/NO

Did you leave the Yard on account of marriage? YES/NO

Detailed questions about your career

1. What made you apply to work in the Yard?
2. Please explain briefly what your job entailed:
3. Did you know what job you wanted to do when you entered the Yard? YES/NO
4. If so, what influenced your decision?
5. If not, how did you choose your trade once you entered the Yard?
6. Did you take the Dockyard Exam? YES/NO
If so:
 7. Did you do well? YES/NO
 8. Did you get your choice of trade? YES/NO
 9. Roughly how many people took the exam in your year?
 10. Please explain the selection process and how it made you feel:

Your colleagues

11. Did you work in groups or individually? GROUP/INDIVIDUALLY
12. Did you know many of your colleagues from life outside the Yard (i.e. school, family, neighbours)? YES/NO
13. If so, please specify roughly how many and where you knew them from:
14. Was there a sense of camaraderie in the Yard? YES/NO
15. Please explain your answer to question 14:
16. Did you go through an initiation? YES/NO
17. If 'yes' please explain the form it took:
18. Were you accepted immediately into your group of workmates? YES/NO
19. Please explain your answer to question 18:
20. Was there rivalry or competition between workers (friendly or otherwise)?
A LITTLE/ A LOT/NOT AT ALL
21. Was there rivalry or competition between trades (friendly or otherwise)?
A LITTLE/ A LOT/NOT AT ALL
22. Did you have to compete against your colleagues in exams to for promotion? YES/NO
23. If 'yes' please

24. Were your work colleagues all of a similar age to you or did people of different ages work in your department/gang?
25. Did you work with anyone who had passed what we now accept as retirement age?
YES/NO
26. If yes, roughly how old were they and did you and your younger colleagues have to compensate for work they could not manage? Please explain your answer:

Outside the Yard

27. Was this your first job? YES/NO
28. If no, where did you work before and what as?
29. If you worked for another organisation at all in your life, please explain in what capacity and how it compared with working in the Yard.
30. Please tell me what you remember about your first day working in the Yard:
31. If you could use just one word to describe the atmosphere and culture of the Yard, which would you choose?
32. Can you remember any of the local companies that relied on or supplied the Yard? If so, please give brief details of the companies and what their connect to the Yard was:
33. Do you remember carrying out any work for other government departments or private companies? YES/NO
34. If so, please can you give brief details (without breaching the Official Secrets Act of course):

The Falklands War

35. Does the photograph above mean anything to you?
36. Do you remember the ENDURANCE coming back to the Yard after the Falklands War? YES/NO
37. Did you go to welcome her home? YES/NO
38. How did you feel about her return?
39. Did you work at the Yard during the Falklands War? YES/NO
40. If so, how did you feel knowing the Yard was closing?
41. Did you think the War might save the Yard from closing? YES/NO
42. Had you worked in the Yard during the Second World War? YES/NO
43. If so, how did your experience compare with that during the Falkland War?

Loyalty

44. Did you feel a sense of loyalty to the Yard? YES/NO
45. Why/why not?
46. Did you feel a sense of loyalty to the Admiralty? YES/NO
47. Why/why not?

For industrialists:

48. Do you remember any of the ships that you worked on? YES/NO
49. If so, please list them (or as many of them as you can remember) here:
50. How did you feel when work finished and the ships sailed out of the Yard?

For clerical workers:

51. Did you ever walk around the Yard or take an interest in the industrial side? YES/NO
52. Were there opportunities for promotion? YES/NO

53. Did you progress your career? YES/NO
54. Did you see yourself as a Civil Servant? YES/NO

Hierarchy

55. Would you say that the Yard had a strict hierarchy? YES/NO
56. If you had a problem or question could you go straight to the Chargeman or Department Manager or would you have to observe the chain of command? YES/NO
57. What was the chain of command?

The Navy

58. Were you aware that you were working for the Navy? YES/NO
59. Were there often naval personnel at the Yard? YES/NO
60. Did you work in the Yard before the abolition of the Nore Command in 1960? YES/NO
61. If so, was it noticeable that the Navy had left the Medway Towns afterwards? Please give examples.
62. What do the following terms mean to you?
a. 'inside the walls'
b. 'job for life'
c. 'scran'
d. 'rabbit'
63. Please list any other dockyard words or phrases that you remember and what they mean to you, what memories they conjure.

Socialising

64. Did you socialise outside of the Yard with any of your work colleagues? YES/NO
65. Were you a member of any of the Yard's clubs? YES/NO
66. If so, which one(s)?
67. Did you go on outings organised through the Yard? YES/NO
68. Please give examples:
69. Did you go to the Navy Days? YES/NO
70. Did you continue to attend Navy Days after you left the Yard? YES/NO

Trade Union Membership

71. Were you a member of a trade union? YES/NO
72. If so which one and why?
73. Did you feel obligated to join? YES/NO
74. How were people who didn't join viewed by trade union members?

Change

75. How did the Yard change, if at all, in the period that you worked there?

Technological change

76. Please detail any technological advancements that were made while you worked at the Yard (i.e. welding, computers, etc):

Management changes

77. Do you remember the reorganisation schemes in the post-1945 period? YES/NO

78. If so, please list the ones you remember and whether you thought they brought any positive changes to the Yard's management:
79. Please give details and your opinion of any changes to your pay and bonus schemes:
80. Do you remember the appointment of Captain William Allen Haynes as Personnel Manager at the Yard in the late 1950s? YES/NO
81. If so, do you think that the personnel management of the Yard was positively influenced by his appointment? YES/NO
82. Please explain your answer to question 81:

Voting and Navy budgets

83. Did you keep abreast of government spending announcements? YES/NO
84. If so, why?
85. Did vote for political parties that you thought would keep the Yard open? YES/NO
86. Which party did you vote for: CONSERVATIVE/ LABOUR/ LIBERAL/ OTHER/ PREFER NOT TO SAY

Communication

87. How were you kept informed of news relevant to your job in the Yard?
88. Did you often visit noticeboards to see what was happening?
89. Do you remember *Periscope*? YES/NO
90. Who was the paper started by (The workers? The Admiralty?)
91. Did you ever contribute anything to *Periscope*? Please give examples.
92. Did you subscribe to it? YES/NO
93. Did you read it? YES/NO
94. What particular articles interested you?
95. Did you feel well informed by Management and the Admiralty? YES/NO
96. Did everyone subscribe to the newspaper? YES/NO

Working Conditions

97. What were your working conditions like?
98. Were there safety precautions? YES/NO
99. If so what and were they introduced when you started working in the job?
100. Did things improve over the years or stay the same? Please explain your answer.
101. Do you suffer from any work related disease or complaint, i.e. industrial deafness, asbestosis, repetitive strain injury?
102. Did health and safety precautions make your job easier or more difficult? Please explain:

People from other nationalities

103. Were employees at the Yard mainly British? YES/NO
104. Did men and women from other countries work in the Yard? YES/NO
105. If so, please list the countries that they came from below:
106. If you came to Britain from overseas, please explain your experience of work in the Yard?
107. Were people from all nationalities treated the same in the Yard? Please explain your answer:

Opportunities for travel

- 108. As a dockyard employee did you have the opportunity to travel to other dockyards to work? YES/NO
- 109. Did all workers have this opportunity? YES/NO
- 110. If not, which workers could travel?
- 111. If you worked in any other dockyards in the UK or abroad, please list them below:
- 112. If you worked in any other dockyards, in the UK or abroad, please explain how they compared to Chatham Dockyard in terms of work, culture, colleagues, camaraderie, etc.:

Women in the Yard

- 113. How were women treated in the Yard?
- 114. Was the Yard a very masculine place? YES/NO
- 115. What sort of jobs did they do?
- 116. Do you remember the first women becoming apprentices? YES/NO
- 117. What did you think about it?
- 118. Did things change when women took on traditionally male jobs?

The Yard's Closure

- 119. Where were you when you heard the closure announcement?
- 120. How did you hear about the closure?
- 121. Please explain how you felt when you heard that the Yard was going to close.
- 122. Were you working for the Yard at the time? YES/NO
- 123. Were you expecting the Yard to close? YES/NO
- 124. Had you been in the Yard all of your working life to the point of the closure? YES/NO
- 125. Had you expected to retire from the Yard? YES/NO
- 126. Once you left the Yard were you able to find another job? YES/NO
- 127. If so, did it use the skills you learned at the Yard?
- 128. How did the closure affect your life?

Today

- 129. Do you visit the Yard now? YES/NO
- 130. Please explain why/why not.
- 131. Did you attend the recent reunion event at the Yard organised by the Historic Dockyard Trust? YES/NO
- 132. Do you attend reunions with your former colleagues? YES/NO
- 133. Do you attend any other reunions for other places where you have worked? YES/NO
- 134. Have you taken part in any other studies of the Yard (i.e. filled out questionnaires, been interviewed)? YES/NO

Appendix 3

Questions asked in asbestos questionnaire

Name:

Trade:

Year first employed at Chatham Dockyard:

Year left employment at Chatham Dockyard:

1. Period exposed to asbestos in the Yard (i.e. 1950 to 1960)?
2. Please provide examples of specific jobs that you worked on that involved working with or near asbestos?
3. Was it common for minor lagging and de-lagging jobs (such as breaking small amounts of lagging from engine components in order to work on them) to be done by tradesmen other Laggings? If so, was this sanctioned by management?
4. Please describe your working environment?
5. Would you say that you were aware of the risks that asbestos posed to your health?
6. Were you provided with protective equipment against the asbestos hazard? If yes, was this before or after 1967?
7. Were you provided with information regarding the health risks of asbestos? If yes, was this before or after 1967? Please give examples if you can.
8. Did you undergo tests, i.e. x-rays or scans, for asbestos-related disease whilst working at the Yard?
9. Did you have access to manuals, such as BR 2101, 3000 or 3001? If so, did you consult them often?
10. Did the working environment change after 1967? Please explain the ways that it changed.
11. Did you receive a copy of the booklet *Working With Asbestos* in or after 1970?
12. Did you view the film *Dust in Dockyards* in or after 1977?
13. Did anyone check to see whether you used protective equipment when working with asbestos?
14. Do you know anyone who has suffered from asbestos-related disease and who worked in the Yard? If so, please can you provide their trade, the disease they suffered from and the years they worked at the dockyard (if known).
15. Do you suffer from asbestos-related disease (i.e. Mesothelioma, Asbestosis, Lung Cancer caused by asbestos or Pleural Plaques)? If yes, which one(s)?
16. Is it possible that you were exposed to asbestos at any other place of work? Please state either the company name(s) or the type(s) of work.

Appendix 4

Questions asked in radiation questionnaire

Name:

Trade:

Year first employed at Chatham Dockyard:

Year left employment at Chatham Dockyard:

17. Period that you worked in the Nuclear Complex (i.e. 1970 to 1980)?

18. Were you a classified nuclear worker?

19. How were you recruited into nuclear work? (i.e. did you apply for a job vacancy, were you offered temporary/casual work, etc.)

20. Why did you decide to work on nuclear submarines?

21. Did you work in the reactor compartments of nuclear submarines?

22. Please describe your work in the Nuclear Complex?

23. Please describe your working environment?

24. Would you say that you were aware of the risks that nuclear radiation posed to your health?

25. Were you provided with protective equipment against the radiation hazard?

26. Were you provided with information/training regarding the health risks of nuclear radiation? Please give examples if you can.

27. Did you undergo regular medicals? What did these involve?

28. Did you have access to manuals, such as BR 2101, 2202, 3000 or 3001? If so, did you consult them often?

29. Did anyone check to see whether you used protective equipment when working in the Nuclear Complex?

30. Was it common for workers to remove their dosimeters/film badges and place them in different areas of the submarine to where they were working? Do you know why this was done?

31. Did you ever witness a nuclear accident or incident, i.e. where someone received a high dose of radiation, inhaled or ingested radiation or was injured while in the Nuclear Complex?

32. Were you ever exposed to radiation above the maximum limit? If so, what action was taken?

33. Were you ever decontaminated? If so, what did this involve?

34. Were you ever hospitalised or subjected to ongoing medical surveillance following major contamination?

35. Do you have a copy of your dose records? If so, are they actual figures or estimated ones following the loss of your actual records?

36. Do you know anyone who has suffered from radiation-induced cancer or leukaemia and who worked in the Yard?

37. Do you have or have you suffered from radiation-related cancer (i.e. Leukaemia, Sarcoma, etc.)?

38. Is it possible that you were exposed to nuclear radiation at any other place of work? Please state either the company name(s) or the type(s) of work.

Appendix 5

Checklist used in interviews and discussion groups

Culture	Apprenticeship	Work
<input type="checkbox"/> Job for life <input type="checkbox"/> Security <input type="checkbox"/> Loyalty/Official Secrets Act <input type="checkbox"/> Pride <input type="checkbox"/> Discipline <input type="checkbox"/> Passive <input type="checkbox"/> Competitive <input type="checkbox"/> God fearing <input type="checkbox"/> Meritocratic <input type="checkbox"/> Equality <input type="checkbox"/> Family atmosphere <input type="checkbox"/> Insular/separate <input type="checkbox"/> Class status/ hierarchy <input type="checkbox"/> Effect on local culture <input type="checkbox"/> Rivalry between trades	<input type="checkbox"/> Dockyard lessons at school? Which school? <input type="checkbox"/> Civil Service Exam – significant community event? <input type="checkbox"/> Other subjects than maths and job specific (i.e. history) <input type="checkbox"/> Religious instruction <input type="checkbox"/> Length of apprenticeships	<input type="checkbox"/> Trades <input type="checkbox"/> Getting to and from work (bikes and buses) <input type="checkbox"/> Typical day <input type="checkbox"/> Working hours <input type="checkbox"/> Unusual stories <input type="checkbox"/> Pay – how did it compare with private wages? <input type="checkbox"/> Benefits <input type="checkbox"/> Bonus schemes (DIBS etc) <input type="checkbox"/> Trade union membership <input type="checkbox"/> Promotional system <input type="checkbox"/> Technical changes <input type="checkbox"/> Changes to management style <input type="checkbox"/> Programme Evaluation and Review Techniques (PERT), Critical Path Analysis and Programme Management Plans (PMPs) <input type="checkbox"/> End of new construction after OKANAGAN <input type="checkbox"/> Nuclear Refitting Complex

Appendix 6

Introduction to group discussions participants and interviewees.

Good morning/afternoon and thank you for agreeing to take part in the Chatham Oral History Project.

As I believe you are all aware, the discussion is going to be taped and so we have a few formalities to go through before we start. I thought we could do this over tea and coffee so it is not too tedious.

First of all I will tell you a little bit more about what I am doing. As you may know I am a PhD student with the University of Hull and this project forms part of my study of the changes to work and culture at Chatham Dockyard in the post-1945 period. I have been studying this period of the Yard's history on and off for several years now, but apart from a small number of questionnaires regarding the closure, that were completed by some former workers in 1998, most of my work has been with official documents. It was while carrying out research at the Chatham Dockyard Historical Society Library that I started to talk to former Yard workers and learned that the story the documents tell is not really a true reflection of the Yard's history. I am here today to ask you all what it was like working inside the walls and how you think the Yard changed, if at all, when you were here.

It would be very difficult for me to take notes while you are all speaking so that's why I have brought the tape recorder along. That way I can make sure that I have a true record of what you have said.

Once we have finished today, I will ask you to sign a release form so that I can use the information on the tapes for my thesis and so that other researchers can use it in the future. I intend to give a copy of the tapes and transcript to the Chatham Dockyard Historical Society, as a measure of thanks for all the help they have given me over the years. I will, however, retain copyright so that anyone who wishes to use the tapes will have to satisfy me that they will use them for genuine research. No-one else will be allowed to copy them unless I give permission.

It is up to you whether you wish to use your own name or a pseudonym, but we will have to agree this first so that your name isn't used on the tape. Alternatively, if when we have finished you feel you have said something you didn't mean to, we can seal that part of the tape. Please be aware that under copyright law, even portions of tape that have been sealed can be revealed to the public 50 years after the death of the interviewee.

Finally I must remind you that you should avoid making false or unsubstantiated statements that might injure a person's or an organisation's reputation on tape, as you and even I could then be prosecuted for libel or slander.

Now that's over we can concentrate on the job in hand.

Appendix 7

Oral History Ethics

The Oral History Society's advice on the ethics of oral history projects was considered in the design of the study and latterly the UK Data Archive's ethical duties (below) were adopted:

- a duty of confidentiality (though not necessarily anonymity) towards informants and participants

- a duty to protect participants from harm, by not disclosing sensitive information

- a duty to treat participants as intelligent beings, able to make their own decisions on how the information they provide can be used, shared and made public (through informed consent)

- a duty to inform participants how information and data obtained will be used, processed, shared, disposed of, prior to obtaining consent

- a duty to wider society to make available resources produced by researchers with public funds (data sharing is required by some funders)

In order to discharge these duties, after a verbal explanation of the purpose of the study and intended use of information, interviewees were asked to sign a release form (see example at Appendix 8), which also assigned copyright to me. It should be noted that during the course of the study, my surname changed from Haxhaj to Taaffe. Interviewees were advised that they could remain anonymous if they wished to. Questionnaire respondents were also provided with information about the study and the intended use of information and were given the option of anonymity.

Appendix 8

Consent for use of information given in group discussion and/or interview for the Chatham Dockyard Oral History Project

Researcher and interviewer: Emma Haxhaj, MA
Contact telephone: (W) 020 7423 2531 (H) 01322 336948
Interviewee: *Andy Eastdown.*

I have been given information about the Chatham Dockyard Oral History Project and the way in which my contribution will be used. It has been explained to me how the transcript of the interview will be kept confidential unless I give permission for my name to be used.

This tape or tapes and the accompanying transcript are the result of one or more recorded voluntary interviews with me. Any researcher should bear in mind that the tape, not the transcript, is the primary document and record of my spoken word.

My contribution will be kept safely and securely with access only to those with permission from the researcher, Mrs Emma Haxhaj.

I understand that I can withdraw my consent at any time by contacting Mrs Haxhaj either on the telephone numbers above or via the Chatham Dockyard Historical Society (01634 823800).

Please tick one of the following:

- I give my permission for the interview(s), which I am about to give/have given and/or the group discussion I am about to participate in for the above project, to be used for research purposes only (including research publications and reports) **with** strict preservation of anonymity.

OR

- I give my permission for the interview(s), which I am about to give/have given and/or the group discussion I am about to participate in for the above project, to be used for research purposes only (including research publications and reports) **without** preservation of anonymity.

I hereby assign the copyright in my contribution to Emma Haxhaj.

Signed: *A Eastdown* Date: *22/3/04*
(Interviewee)

Signed: *E Haxhaj* Date: *22/3/04*
(Emma Haxhaj)

Bibliography

Primary Sources

Manuscript

Campaign for Chatham Dockyard Radiation Workers (CCDRW), held privately.

CCDRW Annual Report 2001-2002

Letter from Thomas (Oscar) Foreman, 22 January 2013.

Radiation and You! : Synopsis of Talk by Mr. P. J. Bonfield to PROM Whitley's 12 July 1966.

Connor, J., *Radiation Protection in Naval Dockyards* (paper presented to Members of House of Commons circa 1998).

Deadman, T., 'Birth of the Nuclear Sponge' cutting from *Campaign for Chatham Dockyard Radiation Workers Newsletter* (date unknown).

Foreman, T., *Introduction* (originally accompanied incident reports).

Wright, T.H., 'The Next To Go' *Campaign for Chatham Dockyard Radiation Workers Newsletter* (August 2002).

Defence Science and Technology Laboratories (DSTL), Gosport, Hants.

Defence Committee *Twelfth Report: Radiological Protection of Service and Civilian Personnel* (London: HMSO, 1990).

Unknown author *HM Dockyard Chatham – Radiation Work* (unknown date)

Chatham Dockyard Historical Society (CDHS), Chatham, Kent.

CDHS Ref 6: radiation.

Hansard (Commons)

Asbestos 13 January 1978 v941 c835W.

Chatham Dockworkers 11 May 1982 v23 cc247-8W.

Chatham Dockyard 28 November 1997 v301, c694W.

Chatham Dockyard (Fire) 20 January 1967 v739 cc159-60W.

Chatham Dockyard (Fire) 27 January 1967 v739 cc379-80W.

Chatham Dockyard (Nuclear Reactor Compartment) 9 May 1978 v949 c459W

Dockyards (Health and Safety) 9 January 1978 v941 c634W.

Health and Safety 10 May 1994 v243 cc201-24.

MODIX 26 November 1997 v301 c562.

Navy Estimates 11 March 1965 v708 c664.

Supply: Navy Estimates 18 March 1947 v435 c212.

House of Commons Library, London.

Gore, D., and Sleator, A., *House of Commons Research Paper 99/81: Asbestos* [accessed online at: www.parliament.uk/documents/commons/lib/research/rp99/rp99-081.pdf.]

HINF 2000/622: Dr Moonie answer to a PQ from Jonathon Shaw MP regarding Chatham Dockyard.

MoD Devonport Civilian Occupational Health Record Archive, Plymouth.

Harries, P.G., *The Effects and Control of Diseases Associated with Exposure to Asbestos in Devonport Dockyard* (MD Thesis).

Death certificates (collated by Dr Peter Harries for extension of asbestos related disease studies to Chatham Dockyard).

List of personnel employed at Chatham Dockyard in 1973.

Personnel and medical records (mainly Devonport workers).

Royal Dockyard Library (RDL), Chatham, Kent.

Accident Photograph Collection.

Apprentice Record Card Collection.

Book of Reference (BR) 2101 *Management Regulations for H.M. Dockyards and Other Admiralty Civil Establishments* 1956.

Chatham Dockyard Lock Logs.

HM Naval Base Chatham *Radiation Safety* (Issue 2) 1973.

1995-0005-03: J.D. Crawshaw, *History of Chatham Dockyard School*

2010-0075-08: Report of a Board of Inquiry held at H. M. Dockyard, Chatham into the Fire at No. 2 Slip.

2010-0075-09: Report of Inquiry into Explosion, of Vertical Cross Tube Boiler in 5 ton Travelling Crane, Yard No 50

2011-0541 Personnel Manager's Temporary Memorandum 39/76: Health and Safety: Use of Fibreglass.

2011-0559-03: Article: Pearce, T., 'Subsmash!' (date and publication unknown)

2011-0560-02: Extract from Hansard 26 January 1955 “HMS Submarine “Talent” (Accident).

2012-0294: Chatham Yard Industrial Whitley Committee Minutes 1954 to 1981.

2012-0021-06 Minor Accidents No. 2 Smithery, 1960-61.

2012-0022-03 Minor Injury Reports Hurt Book 1954 to 1971 – Plumbers Shop.

2012-0021-03 National Insurance (Industrial Injuries) Act 1946 Accident Book (Form B.I. 510A) Mould Loft 1977 to 1983.

Boilershop Hurt Note Book (D189) 1942 to 1947.

Boilershop Hurt Note Book (D 189) 1947 to 1960 (2 volumes).

The Turner & Newall Archive (T&NA), held privately by Professor Geoffrey Tweedale.

Internal correspondence from A.C. Mann to Dr S.Holmes 30 January 1969.

Internal correspondence from E.B. Gates, 31 July 1970: *Asbestos & Health: Admiralty.*

Internal letter from A.C. Mann, Rochdale to E.A. Edmonds, 17 December 1965.

Internal letter from E.A. Edmonds, London Office to Holmes, 5 November 1970.

Internal letter from E.A. Edmonds to A.C. Mann, 7 December 1965.

Internal letter from E.B. Gates to E.A. Edmonds, 30 November 1965.

Internal memorandum from E.A. Edmonds to A.C. Mann, 25 February 1966.

Internal memorandum from E.A. Edmonds to A.C. Mann, 24 June 1966.

Internal memorandum from E.A. Edmonds to Dr S.Holmes, Health Physics, Rochdale, 15 January 1971.

Internal memorandum from E. A. Edmonds to Dr S. Holmes, Health Physics, Rochdale, 4 February 1972.

Internal memorandum from E.A. Edmonds to S Marks, 9 November 1966 Ref EAE/DEG.

Internal memorandum from S Freshwater, London Office to E. B. Gates, 15 February 1971.

Internal note of telephone conversation between A.C. Mann and Mr Wilson, Sales Director, 10 June 1966.

Internal visit report by Dr F C Lewinsohn regarding visit to Plymouth, 27 November 1967.

Letter from P. Harries to Dr Knox, Turner & Newall Asbestos Limited, 6 September 1967.

Letter from T&N’s Secretary to the Ministry of Labour and National Service, 6 December 1950.

Minutes of Board Meeting of Turner & Newall Limited held 26 June 1958.

The National Archives (TNA), Kew, Surrey.

ADM 1/20564: *Silicosis and Asbestosis: Sandblasting*, 1944.

ADM 1/22713: *Loss of the HMS Truculent: Admiralty Statement and Report of Board of Inquiry*, 1950

ADM 1/25305 *No 3 Dock Caisson at Chatham Dockyard – failure of on 15th December 1954*, 1955

ADM 1/26068: “*Where are we going*” board memorandum B983: review of future naval policy, 1955.

ADM 1/27493: *Future of Chatham Dockyard*, 1957-59.

ADM 1/27497: *HM Dockyard Malta Transfer to Messrs. Bailey (Malta) Ltd, Papers to Ministers*, 1959.

ADM 1/28501 (Folder 1 or 2): *HM S/M Dreadnought – Requirements for White Overalls*. Memorandum from AS Rosyth to DGD&M, 11 October 1963.

ADM 1/28574: *HM Dockyard, Chatham: Trades Union representations about decision not to allocate build of one new POLARIS submarine at Chatham*, 1963-65.

ADM 1/29069: *Report on considerations involved in selection of yards to refit nuclear submarines*, 1963-64.

ADM 116/5828: *Commercial and ship repair work in HM dockyards: contract and accounting procedure*, 1946-52.

ADM 234/806: *Radioactive contamination in Ships*, 1961.

ADM 269/14: *Departmental Industrial Whitley Committee: minutes of meetings*

ADM 269/26: *Enquiry into death of skilled labourer on 10 April 1956*

ADM 329/8: *HM Dockyard Devonport: setting up a research project into the means of improving early diagnosis of asbestosis*, 1965-7

BA 27/318: *Compensation arrangements for employees who contracted asbestosis working in the Royal Dockyards*.

BT 169/68: *Monopolies Commission: A Report on the Supply of Asbestos and Certain Asbestos Products*, 1973.

Command Paper No 114: *Accounts of Shipbuilding and Ship Repairing in HM Dockyards and by Contract, Session 1947-48*.

LAB 14/2513: *Ionising Radiations (Unsealed Radioactive Substances) Regulations 1968: application for a special entry to be made in the radiation dose record of an employee of the MOD, HM Dockyard, Chatham, Kent*, 1970-71.

LAB 14/2581: *Shipbuilding and Ship-repairing Regs 1960: correspondence leading up to 1st and 2nd preliminary drafts; observations from interested organisations relating to the use of asbestos*, 1945-1971.

LAB 14/2740: *Enquiry regarding distribution of letter on asbestos insulation aboard ships sent by HMCIF to the shipbuilding industry in 1945*, 1971-80.

LAB 105/11 *Medical Services: survey of asbestos workers: correspondence relating to industrial workers Ministry of Defence, Royal Naval Dockyard, Devonport*, 1972.

PREM 8/759: *Future policy for the Royal Dockyards. Statement on the future of Rosyth as a Naval dockyard in peace-time, 1945-48.*

TS 57/2: *Inquest: Disaster to HMS "Talent" at Chatham Dockyard on 15 December 1954 involving four deaths, 1955.*

Wellcome Library, London

2010/SIR: Sirrs, C., *Health & Safety in the Age of Risk: Britain 1960-1995: The HSE and Beyond* (London: Wellcome Trust Centre for the History of Medicine at University College London, 2010).

Published Primary

Fisher, J. *The Medway Disaster: A Report produced for T.G.W.U. Region No 1* (University of Surrey: 1981).

P.G. Harries, C.E. Rossiter and R.M. Coles *Royal Naval Dockyards Asbestosis Research Project: Report No 1 December 1975: Main Morbidity Study of the Total Population at Devonport, Chatham, Portsmouth and Rosyth Dockyards* (Gosport: Institute of Naval Medicine, 1975).

Health and Safety Executive (HSE) *Shipbuilding and Ship-repairing Health and Safety 1971-78* (London: HMSO, 1980).

Ministry of Defence (Navy) *Working with Asbestos* (London: HMSO, 1970).

Robens, A., *Safety and Health at Work: Committee Report, 1970-72* (HMSO: 1975).

Legal Reports

BAILII *Pacey v Ministry of Defence.*

Lexis Nexis *Bryce v Swan Hunter Group plc. and others.*

Westlaw UK *Edwards v National Coal Board.*

Westlaw UK *Molinari v Ministry Of Defence.*

Westlaw UK *Phillips v Ministry of Defence.*

Coroner's Inquest Hearing, County Hall, Maidstone, 12 May 2011: Brian Thomas Dees.
Coroner: Patricia Harding.

Newspapers

Chatham News

Chatham Observer

Chatham, Rochester and Gillingham News

Chatham Standard

Daily Mirror

Evening Mail

Evening Post

Kent Today

Medway Messenger

Medway News

Periscope

The Guardian

The Sunday Times

The Times

Periodicals

Jane's Fighting Ships

The Navy List

Who Was Who

Who's Who

Secondary Sources

- Abrams, L., *Oral History Theory* (Taylor & Francis e-Library, 2010).
- Andrews, C. J., *The Life and Times of a Dockyard Matey* (privately published, 2006).
- Arnold, L. *Windscale 1957: Anatomy of a Nuclear Accident* (Hampshire: Palgrave MacMillan, 2007).
- Ashby, P., “*Ladies*” of the Colour Loft and Ropery Women: *A Study of Female Employment in the Royal Dockyard at Chatham 1901-1920* (University of London Dissertation, 1991).
- Atkinson, W.D., *et al*, ‘Mortality of employees of the United Kingdom Atomic Energy Authority, 1946-97’ *Occupational & Environmental Medicine* 61:7 (2004).
- Banbury, P., *Shipbuilders of the Thames and Medway* (Devon: David & Charles, 1971).
- Barnaby, K.C., *Some Ship Disasters and their Causes* (New York: A. S. Barnes and Company, 1973).
- Bartram, R., and Shobrook, S., ‘You have to be twice as good to be equal: ‘placing’ women in Plymouth’s Devonport Dockyard’ *Area* 30:1(March 1998).
- Bartrip, P., *Beyond the Factory Gates: Asbestos and Health in Twentieth Century America* (New York: Continuum International Publishing Group Ltd, 2005).
- Bartrip, P., ‘The Rise and Decline of Workmen’s Compensation’ in P. Weindling (ed) *The Social History of Occupational Health* (London: Croom Helm, 1985).
- Bartrip, P., ‘Too Little, Too Late: The Home Office and The Asbestos Industry Regulations 1931’ *Medical History* 42:4 (October 1998).
- Bartrip, P., *Workmen’s Compensation in Twentieth Century Britain: Law, History and Social Policy* (Hants: Gower Publishing Company Limited, 1987).
- Bégin, R., ‘Asbestos-related lung diseases’ in D. Banks & J. Parker (eds) *Occupational Lung Disease: An international perspective* (London:Chapman & Hall Medical, 1998).
- Biddle, R., ‘Naval Shipbuilding and the Health of Dockworkers C1815-1871’ *Family & Commonwealth History* 12:2 (November 2009).
- Boniface, P., *Dreadnought: Britain’s First Nuclear Powered Submarine* (Penzance: Periscope Publishing, 2003).
- Booker, C. and North, R., *Scared To Death: From BSE to Global Warming: Why Scares are Costing Us the Earth* (London: Continuum International Publishing Group, 2007).
- Bourke, J., *Dismembering the Male: Men’s Bodies, Britain and the Great War* (London: Reaktion Books Ltd, 1999).
- Bourke, J., *Working-Class Cultures in Britain 1890-1960: Gender, Class and Ethnicity* (London: Routledge, 1994).
- Brown, D., ‘No 3 Dock Disaster’ *CHIPS* Spring 2008.
- Brown, D.K., *Century of Naval Construction* (London: Conway Maritime Press, 1983).

- Brown, K., *Plutopia: Nuclear Families, Atomic Cities, and the Great Soviet and American Plutonium Disasters* (Oxford: OUP, 2013).
- Butler, L.J., 'History: theory and practice' Butler, L.J. and Gorst, A., *Modern British History: A guide to study and research* (London: I. B. Tauris Publishers, 1997).
- Capper, D.P., *Moat Defensive: A History of the Waters of the Nore Command 55BC to 1961* (London: 1963).
- Casey, N., 'Class Rule: The Hegemonic Role of the Royal Dockyard Schools, 1840-1914' in K. Lunn and A. Day (eds) *History of Work & Labour Relations in the Royal Dockyards* (London: Mansell, 1999).
- Castleman, B., *Asbestos: Medical and Legal Aspects* 4th Edition (New Jersey: Aspen Law & Business, 1996).
- Caulfield, C. *Multiple Exposures: Chronicles of the Radiation Age* (London: Secker & Warburg, 1989).
- Childish, B., *My Fault* (London: Virgin Books Ltd, 2005).
- Childish, B., *The Stonemason (Failure Books 4)* (London: I-13, 2011).
- Coad, J., *The Royal Dockyards 1690-1850* (Hampshire: Scolar Press, 1989).
- Coats, A., 'Bermuda Naval Base: Management, Artisans and Enslaved Workers in the 1790s' *Mariner's Mirror* 95:2 (2009).
- Colledge, J.J. (Revised by Lt-Cdr B Warlow) *Ships of the Royal Navy: The Complete Record of all Fighting Ships of the Royal Navy from the Fifteenth Century to the Present* (London: Greenhill Books, 2003).
- Connell, R. W., *The Men And The Boys* (Cambridge: Polity Press, 2000).
- Court Brown, W.M., *et al* 'Geographical Variation in Leukemia Mortality in relation to Background Radiation and Other Factors' *British Medical Journal* 11 (June 1960)'.
 Crace, J.G., *Some Notes on the History of Chatham Dockyard* (1946).
- Crawshaw, J.D., *History of Chatham Dockyard* (Published privately in Newcastle-upon-Tyne: Isabel Garford, 1999).
- Crooks, E., *The Factory Inspectors: A Legacy of the Industrial Revolution* (Stroud: Tempus Publishing, 2005).
- Cross, T.K., 'Changes in technology and social structures in the past 60 years and their impact on the inspectors work' *Her Majesty's Inspectors of Factories 1833-1983: Essays to commemorate 150 years of health and safety inspection* (HMSO: 1983)
- Dalton, A., *Asbestos Killer Dust: A worker/community guide: how to fight the hazards of asbestos and its substitutes* (London: BSSS Publications, 1979).
- Davies, H. (Ed) *Sellafield Stories: Life with Britain's First Nuclear Plant* (London: Constable & Robinson Ltd., 2012).
- Day, A., 'The forgotten 'mateys': women workers in Portsmouth Dockyard, England, 1939-45' *Women's History Review* 7:3 (1998).

- Day, A. and Pritchard, G. *Staying Afloat: Recollections of Portsmouth Dockyard 1950-present day* (University of Portsmouth, 1999).
- Doll, R., 'Mortality from Lung Cancer in Asbestos Workers' *British Journal of Industrial Medicine* 12:2 (April 1955).
- Dudink, S., Hagemann, K. and Tosh, J. (eds) *Masculinities in Politics and War: Gendering Modern History* (Manchester University Press, 2004).
- Esbester, M., 'Organizing work: Company magazines and the discipline of safety' *Management & Organizational History* 3:3-4 (2008).
- Fisher, J., *Medway Disaster: A report produced for TGWU Region No 1* (University of Surrey, November 1981).
- Fulbrook, M. *Historical Theory* (Taylor and Francis e-Library, 2004).
- Gee, D., 'Occupational Exposures and the Case for Reducing Dose Limits' in R. Russell-Jones and R. Southwood (Eds) *Radiation and Health: The Biological Effects of Low-Level Exposure to Ionizing Radiation* (Chichester: John Wiley & Sons, 1987, p107).
- Gloag, D., 'Risks of Low Level Radiation – the Evidence of Epidemiology' *British Medical Journal* 281 (November 1980).
- Goodman, J.F.B., 'Strikes in the United Kingdom: Recent Statistics and Trends' in Evans, E.W. and Creigh, S.W., (eds) *Industrial Conflict in Britain*.(London: Frank Cass).
- Greenberg, M., 'The Doctors and the Dockers' *American Journal of Industrial Medicine* 45 (2003).
- Greenberg, M. and Wikeley, N., 'Too little, too late? The Home Office and the Asbestos Industry Regulations, 1931: A Reply' *Medical History* 43 (1999).
- Grele, R.J., 'Movement without aim: Methodological and theoretical problems in oral history' Perks and Thomson (Eds) *The Oral History Reader*.
- Grove, E.J., *Vanguard to Trident: British Naval Policy since World War II* (London: The Bodley Head, 1987).
- Haas, J.M., 'The Best Investment Ever Made: The Royal Dockyard Schools, Technical Education, and the British Shipbuilding Industry, 1800-1914' *Mariner's Mirror* 76:4 (November 1990).
- Hale, H. C., 'The Role of Practice in the Development of Military Masculinities' *Gender, Work & Organisation* doi: 10.1111/j.1468-0432.2010.00542.x.
- Hall, D., *Working Lives: The forgotten voices of Britain's post-war working class* (London: Bantam Press, 2012).
- Hamblin, J.D. 'A Dispassionate and Objective Effort: Negotiating the First Study on the Biological Effects of Atomic Radiation' *Journal of the History of Biology* 40 (2007).
- Harries, P.G., 'Asbestos Dust Concentrations in Ship Repairing: A Practical Approach to Improving Asbestos Hygiene in Naval Dockyards' *Annals of Occupational Hygiene* 14 (1971).
- Harries, P.G., 'Asbestos Hazards in Naval Dockyards' *Annals of Occupational Hygiene* 11 (1968).

- Haxhaj, E. 'More Bang for a Bob: The Decision to 'Go Nuclear' and its Impact on Chatham Dockyard' *Mariner's Mirror*, 91 (November 2005).
- Heller, M., 'Company Magazines 1880-1940: An Overview' *Management & Organizational History* 3:3-4 (2008).
- Iacuone, D., "'Real Men Are Tough Guys": Hegemonic Masculinity and Safety in the Construction Industry' *The Journal of Men's Studies* 13:2 (2005).
- International Union Against Cancer 'The Association of Exposure to Asbestos Dust and Cancer: A Report from a Working Group of the International Union Against Cancer' *Annals of Occupational Hygiene* 8:3 (July 1965).
- Irwin, A., *Citizen Science: A Study of People, Expertise and Sustainable Development* (London: Routledge, 1995).
- Jacobson, A.P., *et al* 'The Role of Natural Radiations In Human Leukemogenesis' *American Journal of Public Health* 66:1 (January 1976).
- Johnman, J., Johnston, I. and Mackenzie, I., *Down the River* (Glendaruel: Argyll Publishing, 2001).
- Johnston, R. and McIvor, A., 'Dangerous Work, Hard Men and Broken Bodies: Masculinity in the Clydeside Heavy Industries' *Labour History Review*, 69 (2004).
- Johnston, R. and McIvor, A., "'Dust to Dust': Oral Testimonies of Asbestos-Related Disease on Clydeside, c1930 to the Present' *Oral History* 29:2 (2001).
- Johnston, R. and McIvor, A., 'Incubating Death: working with asbestos in Clydeside shipbuilding and engineering, 1945-1990' *Scottish Labour History* 34 (1999).
- Johnston, R. and McIvor, A., *Lethal Work: A History of the Asbestos Tragedy in Scotland* (East Lothian, Scotland: Tuckwell Press, 2000).
- Johnston, R. and McIvor, A., 'Marginalising the Body at Work? Employers' Occupational Health Strategies and Occupational Medicine in Scotland c. 1930-1974' *Social History of Medicine* 21:1.
- Johnston, S.F., *The Neutron's Children: Nuclear Engineers and the Shaping of Identity* (Oxford: OUP, 2012).
- Jordanova, L., *The Look of the Past: Visual and Material Evidence in Historical Practice* (CUP, 2012).
- Kemp, P. J., *The T-Class Submarine: The Classic British Design* (London: Arms and Armour Press, 1990).
- King, F., 'The Royal Dockyard Schools and their Education System' *The Mariner's Mirror* 99:4 (November 2013).
- Kipling, R., 'The Secret of the Machines' in Fletcher, C.R.L. and Kipling, R., *A School History of England* (Oxford: Clarendon Press, 1911).
- Klopper, H., *To Fire Committed: The History of Fire-Fighting in Kent* (Kent: The Kent Council of Fire Services National Benevolent Fund, 1984).
- Knight, R.J.B., *The Royal Dockyards in England at the Time of the American War of Independence* (University of London: 1972).

- Lacy, M., *The Female Shipwright* (London: National Maritime Museum, 2008).
- Lambert, A., 'The Impact of Naval Technology on Warship Construction and Repair at Devonport, 1815-1986' in Duffy, M *et al* (eds) *The New Maritime History of Devon: Volume II: From the Late Eighteenth Century to the Present Day* (London: Conway Maritime Press, 1994).
- Lambert, B. *How Safe is Safe? Radiation Controversies Explained* (London: Unwin Hyman, 1990).
- Law, A., 'Neither Colonial nor Historic: Workers' Organization at Rosyth Dockyard, 1945-95' Lunn, K. and Day, A., (eds) *History of Work & Labour Relations in the Royal Dockyards* (London: Mansell, 1999).
- Leopold, E., *Under the Radar: Cancer and the Cold War* (London: Rutgers University Press, 2009).
- Lewing, P., *Recollections* (unpublished memoir, 2008).
- Lummis, T., *Listening to History: The Authenticity of Oral Evidence* (London: Hutchinson, 1987).
- Lummis, T., 'The Occupational Community of East Anglian Fishermen: An Historical Dimension Through Oral Evidence' *The British Journal of Sociology* 28:1 (March 1977).
- Lunn, K., 'The Way Forward? The Royal Dockyards since 1945' Lunn, K. and Day, A., (eds) *History of Work & Labour Relations in the Royal Dockyards* (London: Mansell, 1999).
- Lunn, K. and Day, A., 'Continuity and Change: Labour Relations in the Royal Dockyards, 1914-50' Lunn, K. and Day, A., (eds) *History of Work & Labour Relations in the Royal Dockyards* (London: Mansell, 1999).
- Lunn, K. and Day, A., (eds) *History of Work & Labour Relations in the Royal Dockyards* (London: Mansell, 1999).
- MacDougall, P., *A Century of Chatham: Events, People and Places over the Last 100 Years* (Swindon: WHSmith, 2002).
- MacDougall, P., *Chatham Dockyard in Old Photographs* (Gloucestershire: Alan Sutton Publishing Limited, 1994).
- MacDougall, P., *Chatham Dockyard: The Rise and Fall of a Military Industrial Complex* (Gloucestershire: The History Press, 2012).
- MacDougall, P., *Chatham Past* (West Sussex: Phillimore & Co. Ltd., 1999).
- MacDougall, P., 'The Changing Nature of the Dockyard Dispute' Lunn, K. and Day, A., (eds) *History of Work & Labour Relations in the Royal Dockyards* (London: Mansell, 1999).
- MacDougall, P., *The Chatham Dockyard Story* (Kent: Rochester Press, 1981).
- MacDougall, P., *The Chatham Dockyard Story: Revised and Expanded Edition* (Rainham: Meresborough Books, 1987).
- MacDougall, P., *The Royal Dockyards* (Newton Abbot: David & Charles, 1982).

- McLean, A.S., 'The Health of Workers Exposed to Ionizing Radiations' *British Journal of Industrial Medicine* 12 (1955).
- McCulloch, J., and Tweedale, G., *Defending the Indefensible: The Global Asbestos Industry and its Fight for Survival* (Oxford: OUP, 2008).
- Maines, R., *Asbestos & Fire: Technological Trade-Offs and the Body at Work* (London: Rutgers University Press, 2005).
- Margolis, B.L. and Kroes, W.H., *The Human Side of Accident Prevention: Psychological Concepts and Principles Which Bear on Industrial Safety* (Illinois: Charles C Thomas, 1975).
- Martin, A. and Harbison, S.A., *An introduction to Radiation Protection, Second Edition* (London: Chapman and Hall, 1979).
- Mesothelioma UK *What is Mesothelioma?* (Leicester, Mesothelioma UK: 2010).
- Meyer, J. *Men of War: Masculinity and the First World War in Britain* (Hampshire: Palgrave Macmillan, 2011).
- Moore, J. E., *The Impact of Polaris: The Origins of Britain's Seaborne Deterrent* (Huddersfield: Richard Netherwood Ltd, 1999).
- Morriss, R., *The Royal Dockyards during the Revolutionary and Napoleonic Wars* (Leicester University Press: 1983).
- Muirhead, C.R. *et al Third Analysis of the National Registry for Radiation Workers: Occupational Exposure to Ionising Radiation in Relation to Mortality and Cancer Incidence* (Oxfordshire: Health Protection Agency, 2009).
- Murphy, H., 'The Health of Electric Arc Welders and the Adoption of Arc Welding in the British Shipbuilding Industry, 1930-51' *International Journal of Maritime History* 17:1 (2005).
- Nailor, P., *The Nassau Connection: Organization and Management of the British Polaris Project* (London: HMSO, 1988).
- Needleman, C., 'Ritualism in Communicating Risk Information' *Science, Technology & Human Values* 12:3/4. c
- Newhouse, M. and Thompson, H., 'Mesothelioma of the Pleura and Peritoneum Following Exposure to Asbestos in the London Area' *British Journal of Industrial Medicine* 22:4 (October 1965).
- Nott, J., *Here Today, Gone Tomorrow: Recollections of an errant politician* (London: Politico's Publishing, 2002).
- Nye, M., *Meso Warrior: One Woman's Fight Against Mesothelioma* (UK: Trotting Dog Media, 2010).
- O'Riordan, M. *Radiation Protection: A Memoir of the National Radiological Protection Board* (Oxfordshire: Health Protection Agency, 2007).
- Oliver, T.P. 'Accident Problems in a Nuclear Dockyard' *Annals of Occupational Hygiene* 11 (1968).

- Paap, K., *Working Construction: Why White Working-Class Men Put Themselves – and the Labor Movement- in Harm’s Way* (Ithaca: Cornell University Press, 2006).
- Pearce, P. H. and Masters, P., *Fifty Vigilant Years: A History of the Kent Fire Brigade 1948 – 1998* (Snodland: Smurfit Townsend Hook, 1998).
- Perks, R. *Oral History: Talking about the Past* (London: The Historical Association, 1995).
- Perks, R. and Thomson, A.,(eds) *The Oral History Reader* (London: Routledge, 1998).
- Presnail, J., *Chatham: The Story of a Dockyard Town and the Birthplace of the British Navy* (Chatham: The Corporation of Chatham, 1952).
- Preston, J.M., *Industrial Medway: an historical survey* (privately published in 1977).
- Raffle, P.A.B., *et al* (eds) *Hunters Diseases of Occupations: 8th Edition* (Kent: Edward Arnold Publishers, 1994), Selwyn, N., *The Law of Health & Safety at Work 1998/99* (Surrey: Croner Publications Limited, 1998).
- Rayner, A., ‘H.M.S Talent Disaster 1954: An Eyewitness Account’ *CHIPS* (newsletter of the Chatham Dockyard Historical Society) Summer 2008.
- Ridley, J. R. and Channing J., *Safety at work* (London: Butterworth-Heinemann, 2003).
- Roper, M. ‘Between Manliness and Masculinity: The “War Generation” and the Psychology of Fear in Britain, 1914-1950’ *Journal of British Studies* 44 (April 2005).
- Ross, M., and Nolan, R.P., ‘History of asbestos discovery and use and asbestos-related disease in context with the occurrence of asbestos within the ophiolite complexes’ Dilek, Y., *Ophiolite Concept and the Evolution of Geological Thought* Geological Society of America Special Publication 373.
- Russell, J. R., ‘Asbestos a failure?’ *Her Majesty’s Inspectors of Factories 1833 – 1983: Essays to commemorate 150 years of health and safety inspection* (London: HMSO, 1983).
- Ryan, J., ‘Women Naval Dockyard Workers in two 19th Century Dockyard Towns: Chatham and Plymouth’ (MPhil thesis, University of Greenwich, 2011).
- St. Leger Brockman, J., ‘The National Insurance (Industrial Injuries) Act’ *Transactions of the Society of Occupational Medicine* 21 (1971).
- Selikoff, I., *et al* ‘Asbestos Disease in United States Shipyards’ *Annals of the New York Academy of Sciences* 330 (December 1979).
- Selikoff, I. and Hammond, E., ‘Asbestos Exposure and Neoplasia’ *The Journal of the American Medical Association* 188:1 (April 1964).
- Sellers, C., *Hazards of the Job: From Industrial Disease to Environmental Health Science* (Chapel Hill, USA: University of North Carolina Press, 1997).
- Sellers, C. and Melling, J., ‘From Dangerous Trades to Trade in Dangers: Toward an Industrial Hazard History of the Present’ in Sellers, C. and Melling, J. (eds) *Dangerous Trade: Histories of Industrial Hazard Across A Globalizing World* (Philadelphia, USA: Temple University Press, 2012).
- Selwyn, N., *The Law of Health & Safety at Work 1998/99* (Surrey: Croner Publications Limited, 1998).

- Sheers, G. and Templeton, A. R., 'Effects of Asbestos in Dockyard Workers' *British Medical Journal* 3:5618 (1968).
- Smith, R., *A Dockyard Apprentice's Story: Hard graft, scrapes and japes on the long road to becoming a trained engineer* (Gloucestershire: Memoirs Publishing, 2012).
- Speed, K., *Sea Change: The Battle for the Falklands and the Future of Britain's Navy* (Bath: Ashgrove Press, 1982).
- Sponsler, R. and Cameron, J.R., 'Nuclear shipyard worker study (1980–1988): a large cohort exposed to low-dose-rate gamma radiation' *International Journal of Low Radiation* 1:4 (2005).
- Stanton, J., *The Last Cast Off: A Dockyard Community Remembers* (AIM Publications: Gillingham, Kent, 1990).
- Stark, S.J., *Female Tars: Women Aboard Ship in the Age of Sail* (London: Pimlico, 1998).
- Stumphius, J., 'Epidemiology of mesothelioma on Walcheren Island' *British Journal of Industrial Medicine* 28 (1971).
- Tait, N., *Asbestos Kills* (Silbury Fund, 1976).
- Thompson, P., 'The voice of the past: Oral history' R. Perks and A. Thomson (Eds) *The Oral History Reader* (London: Routledge, 1998).
- Tosh, J *Manliness and Masculinities in Nineteenth-Century Britain* (Harlow: Pearson Education Limited, 2005).
- Tosh, J. 'Masculinities in an Industrializing Society: Britain, 1800-1914' *Journal of British Studies* 44 (April 2005).
- Tweedale, G., *Magic Mineral to Killer Dust: Turner & Newall and the Asbestos Hazard* (Oxford: OUP, 2000).
- Tweedale, G., 'Sprayed "Limpet" Asbestos: Technical, Commercial, and Regulatory Aspects' in G. Peters and B. J. Peters *Sourcebook on Asbestos Diseases Vol 20* (USA: Lexis Law Publishing, 1999).
- Tweedale, G., 'Straws in the wind: the local and regional roots of an occupational disease epidemic' *Business in the North West - Manchester Region History Review* 21 (2010).
- Tweedale, G., 'The Rochdale Asbestos Cancer Studies and the Politics of Epidemiology: What You See Depends on Where You Sit' *International Journal of Occupational and Environmental Health* 13 (2007).
- Unknown 'Remarkable Properties of Radium, May 9, 1903' reprinted in *Journal of the American Medical Association* 289:18 (2003).
- Wagner, J.R., *et al* 'Diffuse Pleural Mesothelioma and Asbestos Exposure in the North Western Cape Province' *British Journal of Industrial Medicine* 17:4 (October 1960).
- Ward, A., *Is your oral history legal and ethical?* (London: Oral History Society, 2003) <http://www.oralhistory.org.uk/ethics/index.php>.
- Waters, M., 'Changes in the Chatham Dockyard Workforce, 1860-90. Part I: From wood to iron: change and harmony, 1860-87' *Mariner's Mirror* 69:1 (1983).

- Waters, M., 'Changes in the Chatham Dockyard Workforce, 1860-90. Part II: From iron to steel: change and suspicion 1887-90' *Mariner's Mirror* 69:2 (1983).
- Waters, M., 'Craft Consciousness in a government enterprise: Medway dockyardmen 1860-1906' *Oral History* 5:4 (1977).
- Waters, M., *Some Gleanings from the history of a Dockyard town, Local history Series No 10* (Kent County Library, date unknown).
- Waters, M., 'The Dockyardmen Speak Out: Petition and Tradition in Chatham Dockyard, 1860-1906' Lunn, K. and Day, A., (eds) *History of Work & Labour Relations in the Royal Dockyards* (London: Mansell, 1999).
- Waters, M., 'The Dockyard Work-Force: A Picture of Chatham Dockyard c1860' *Archaeologia Cantiana* 97 (1981).
- Weindling, P., 'Linking Self Help and Medical Science: the Social History of Occupational Health' in P. Weindling (ed) *The Social History of Occupational Health* (London: Croom Helm, 1985).
- Wesley, J., 'Background Radiation as the Cause of Fatal Congenital Malformation' *International Journal Radiation Biology* 2:1 (1960).
- Wright, D.S., 'The History and Development of the Medical Services of H.M. Dockyard, Chatham, 1625-1966' *The Journal of the Royal Naval Medical Service* 54:1 (Spring 1968).
- Wynne, B., 'May the Sheep Safely Graze/? A Reflexive View of the Expert-Lay Knowledge Divide' in Lash, S., Szerszynski, B. and Wynne, B., (eds) *Risk, Environment & Modernity: Towards a New Ecology* (London: Sage Publications Ltd, 1996).
- Yow, V. R. *Recording Oral History: A practical guide for social scientists* (California: Sage Publications, Inc., 1994).

Film

Asbestos: A Matter of Time film by the US Bureau of Mines (US Ministry of the Interior) in co-operation with asbestos products company Johns Manville, 1959. Viewed using Google Videos:

<http://video.google.com/videoplay?docid=1175739291888112589#>

BBC Panorama *The Price of Piece*. Transcript at:

http://news.bbc.co.uk/1/hi/english/static/audio_video/programmes/panorama/transcripts/transcript_26_01_98.txt.

Websites

Alan Care: <http://www.alancare.com/asbestosuk/lsekse.html> [personal injury lawyer who has acted on behalf of Chatham Dockyard workers. Site accessed on various dates in 2011].

British Film Institute online Film and Television Database:

<http://ftvdb.bfi.org.uk/sift/title/193775> [Site accessed on various dates in 2010].

Friends Reunited <http://www.friendsreunited.co.uk> [accessed on various dates in 2008].

Health & Safety Executive (<http://www.hse.gov.uk>) [accessed on various dates from 2010 to 2013].

Industrial Injuries Advisory Council <http://iiac.independent.gov.uk> [accessed on various dates 2011 and 2012].

Kent Messenger <Http://www.kentonline.co.uk> [accessed on various dates from 2010 to 2013].

Legislation: <http://www.legislation.gov.uk> and <http://www.opsi.gov.uk> [accessed on various dates 2009 to 2012].

MoD/AWE Compensation Scheme Management Board *Progress Report to the Compensation Scheme Council* November 2012 (http://www.csrlid.org.uk/html/mod_awe.php).

National Geographic News <http://news.nationalgeographic.com> [accessed March 2012].

National Health Service: <http://nhs.gov.uk> [accessed on various dates].

Nuclear Information and Resource Service *Safety Deficiencies at Browns Ferry Nuclear Power Complex*: <http://www.nirs.org/factsheets/brownsferryfactsheet.pdf> (US, 2007).

Pub Med database: <http://www.ncbi.nlm.nih.gov/pubmed/> [Site accessed on various dates 2011-2013].

The Telegraph <http://www.telegraph.co.uk> [accessed April 2012].

The Times <http://www.timesonline.co.uk> [accessed on various dates from 2010 to 2013].

Thomson Snell and Passmore: <http://www.ts-p.co.uk> [personal injury lawyer who has acted on behalf of Chatham Dockyard workers. Site accessed on various dates in 2011].

<http://www.thompsons.law.co.uk/ltxt/lb0907-new-asbestos-watershead.htm> [accessed April 2012].

University of Sussex Centre of Life History and Life Writing Research <http://www.sussex.ac.uk> [accessed January 2013].

US Department of Energy, Bulletin Issue 91-3, September 1991: A Study of Mortality In Shipyard Workers Involved in Work on Naval Nuclear-Powered Ships: http://www.hss.energy.gov/publications/esh_bulletins/BULL0068.html.

BBC News online archive <http://news.bbc.co.uk/> [accessed on various dates 2012].

You Tube: <http://www.youtube.com/watch?v=LQeZrnD7O9E> [accessed April 2011].