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- 3101 Divers Checks. - Once all operations for grounding are complete, the platform is raised. Before grounding, the divers visually inspect the blocks and cappers to ensure no debris is fouling them (SOP 920(N) (Ref. 21)).
- 3102 Grounding and move to 2m above Grounding (SSBN). - Just before grounding on the blocks, the 'Set Ship Grounding' button is pressed. The computer now automatically sets the 'Ship Grounded' values for the bar-graph load display at 5t. The PLMS monitors the increasing load as grounding continues. If, during any lifting operations, the Docking Officer considers that any high load trip will occur on the PLMS, then the docking operation shall be stopped. The Docking Officer will inform the DNSAG and proceed under DNSAG control in accordance with EOP 976(N) (Ref. 22).
- 3103 When docking nuclear submarines, the control room is manned by at least the SCR operator, Supervisor, DNSAG Chairman and the Docking Officer. Part 4 and the CLOSO FSR discuss manning conditions and limits of safe operation.
- 3104 The lifting operation is stopped at a height of 2m (SSBN) or 1m (SSN) above grounding which provides sufficient time for the connection of SW services before platform movement is required to compensate for tidal rise. The hoist load profile is checked for compliance with the expected HDLP by the DO. If the load profile is not compliant with the expected HDLP, divers visually inspect the blocks and cappers relative to the submarine hull to ensure that correct location of the submarine has taken place and nothing has fouled the cradle/hull alignment. The Tirfors and plumb bobs are removed once the decision to continue raising and not float off and re-ground is made.
- 3105 Where time permits, the connection of SW services and guard-rails can be done with the vessel afloat. The platform can be positioned at not more than 1m from the vessel hull at the lowest tide for that period in order to minimise the depth of dive for connection of the SW discharge hoses to the platform. This will only be conducted when the vessel is aligned to the satisfaction of the alignment party.
- 3106 Raising the Platform until it is 1m Clear of the Water. - On completion of all post-grounding activities, the platform is raised until the decking is no more than 1m clear of the water and a Health Physics survey is then conducted beneath the submarine. Until this is complete anyone accessing the platform must wear personal dosimetry. A complete set of resilient mount compression readings are taken, and a CDLP is calculated in accordance with SOP 962(N) (Ref. 26).
- 3107 If the CDLP is outside these limits, the docking may be aborted. If the CDLP is outside these limits the readings shall be assessed by the DNSAG. Judgement will be applied, based on a balance of risk argument, as to whether to allow the docking to continue or to abort it.
- 3108 Raising to Maintenance Level. - When approval to continue the docking has been given, the platform is raised to a suitable level where all berthing ropes and head rope can be removed. The platform is then raised to the 'Maintenance Level'. Whilst the HDLP is continuously monitored and compared with the expected HDLP the platform is "levelled". The pins are inserted, visually checked and the platform is lowered 'down to pins'. The 2nd CDLP check may now be conducted in accordance with SOP 962(N) (Ref. 26).

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- 3109 Throughout the lift, particularly at the point that the submarine leaves the water, the Docking officer confirms that the actual HDLP is compliant with the expected HDLP as displayed in the SCR. The winch wells are manned throughout all platform moves and remain in communication with the SCR supervisor.
- 3110 The DNSAG has discretion to permit a 'marginal exceedance' of the CDLP based on the balance of risk of conducting an undocking and subsequent re-docking. The platform DSR (Ref. 9) provides more specific guidance on what constitutes a 'marginal exceedance' of the Allowable Differential Load (ADL), i.e. the normal ADL limit is 50t however exceedances up to 53t are now considered acceptable. An ADL of greater than 53t is considered unacceptable.
- 3111 Inspection of the HDLP and CDLP will indicate whether the expected fault can be corrected by realigning the submarine on the cradle. If this is the case, the submarine may be re-floated and then re-grounded, after which the lift will re-commence according to the standard docking procedures (SOP 920(N) (Ref. 21)). Where the load excess cannot be corrected by realignment, the submarine may be undocked and removed from the Shiplift to permit adjustment of the cappers.
- 3112 Actions above the point of Grounding. - To further safeguard the nuclear safety of the nuclear submarine between the period after grounding until at 'Maintenance Level on-Pins' the following additional restrictions apply:
- Crane Movements. - In general, use of the Shiplift EOT cranes is prohibited during this period, although movements with limitations on space envelope and weight/height of lift, are permitted with a nuclear submarine at a height up to 2m above grounding, and with the platform raised and pinned at the Maintenance level. For further information see Shiplift EOT and 12 Berth Cranes DSRs (Ref.6 and Ref. 8).
 - Vehicle Movements. - Vehicles are only allowed in the Shiplift building during docking evolutions when the vessel is supported by the hoist ropes if they have been specifically authorised by the Docking Officer.
- 3113 If a docking is to be aborted following DNSAG consideration then the platform is lowered and the submarine is returned to the water. Careful monitoring of HDLP is continued throughout the process and appropriate investigations to assess the cause of any apparent or actual load exceedance are carried out.

Support During the Dock Period

- 3114 Submarine Docked/Platform Down to Pins. – Once all post docking actions have been satisfactorily completed, as detailed in SOP 920 (Ref. 21), nuclear submarine maintenance and normal operations can commence when the platform is at the Maintenance Level, with pins inserted and the Shiplift made safe by opening the MCBs to the six MCCs which control the individual hoists.
- 3115 Crash Mats and Docked Platform Preparations. – Crash mats are used to spread any potential dropped load across a large area. Their use is more fully described in Para 3137. They are constructed in accordance with SOP 980 (Ref. ³³) and positioned on the North side of the platform (Port side of vessel) adjacent to the access hatches. 3 are used for SSBNs with 2 for SSNs. Additional crash mat protection may be rigged to support specific procedures e.g. anchor ranging and hydroplane removal. Rail covers and sheave protection covers are rigged. Pre production health and safety

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rounds are conducted in accordance with the safety plan for docked vessels and the Clyde Management System to ensure that the dock is sufficiently safe to start the work package.

- 3116 The Facility is manned 24 hours a day using a shift system, which provides maintenance and operational support to the Facility. The shift is led by a Duty Operations Engineer and consists of M&E personnel supported by non-craft personnel. They are responsible for carrying out routine maintenance and defect rectification as required and monitoring in the control room e.g. SW and seismic alarms. All personnel are Suitably Qualified and Experienced Personnel (SQEP). All work in the Shiplift facility is administered by a Control of Work system (Ref. ³⁴). This ensures that maintenance is planned and progressed in line with docking requirements and that all work is undertaken under a permit to work system.
- 3117 With a nuclear submarine berthed within the Shiplift or docked on the platform, the SCR remains manned at all times. The SCR watchkeeper monitors the SWC pressure, etc. Monitoring of other supplies is the responsibility of the Control Engineer in the NUB. If a signal is received giving gale or storm warnings, or if the wind speed reading exceeds 40 knots, the Duty Operations Engineer is informed and the VEDs and TADs are checked closed and secure.
- 3118 Regular rounds are conducted throughout the Shiplift whenever the platform is occupied by a nuclear submarine. To avoid the risk of inadvertent operation of the platform, a tag-out procedure is in place (CMS Process Map (Ref. ³⁵)).
- 3119 The 2 access and 2 egress brows are manoeuvred into position and fitted in accordance SOP 920(N) (Ref. 21) and SOP 943(N) (Ref.5).
- 3120 The following Mechanical Handling Equipment (MHE) may be used in the Shiplift when the platform is occupied, in accordance with SOP 972(N) (Ref. 36) and obeying the design limits stated in paragraph 3123:
- a. Small mobile cranes.
 - b. Counterbalance forklift trucks.
 - c. Telescopic forklift trucks.
 - d. Mobile access platforms.
- 3121 The Maintainer and Design Authority for Shiplift Facility MHE is Director of Logistics (DLogs) (Shiplift SOR (Ref. 19)). MHE is used on the platform to minimise the transportation of loads by EOT cranes over sensitive equipment. When a nuclear vessel is occupying the Shiplift platform, all MHE movements onto and from the platform take place via the North Cope Dock Levellers. When there is a nuclear vessel on 12 Berth and the platform is not in use, the use of MHE on the South Cope is controlled via the Clyde Management System and DNSAG approved documentation.
- 3122 The function of the MHE is to provide a safe means of:
- a. Transferring loads from the North Cope via designated Dock Levellers to assigned pick up points.

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- b. Providing access to external areas of the hull, in accordance with approved DNSAG procedures.
- 3123 There are design limits, which shall not be exceeded. It is recognised that failure/operator error relating to the MHE may have the potential to provide a hazard to safety - related plant and services. The primary defence against this hazard is the use of authorised training, maintenance and control procedures (SOP 972(N) (Ref. ³⁶) and CMS Process Map (Ref. ³⁷)), which have been put in place. The safety requirements specified which the MHE must not exceed are as follows:
- a. The platform maintenance load of 5 kiloNewtons per metre square (kN/m²).
 - b. The single axle loading of 12.3t when crossing the designated Dock Levellers.
 - c. The maximum load carried across the Dock Levellers on the main and rudder sections of the Shiplift platform is 2t (DSR, Ref. 9). (For loads above 2t the DNSAG will review the procedure on a case by case basis).
 - d. MHE must follow routes as directed by the authorised documentation and must remain a minimum of 1.5m from the platform edge except when crossing the Dock Levellers.

Undocking

- 3124 Undocking is carried out broadly as a reversal of the docking procedure in accordance with SOP 921(N) (Ref. 27).
- 3125 During undocking, two sets of docking block resilient mount readings may be taken and CDLPs are calculated. The first set is taken and calculated within 24 hours of the planned undocking in accordance with SOP 962(N) (Ref. 26). The second set is not automatically taken when the platform is levelled, up off the pins unless the DNSAG consider it necessary. The readings are assessed by the DNSAG in order to decide what corrective action, if any, is to be taken before the undocking continues.
- 3126 The preparations for undocking are similar to those for nuclear submarine docking. The following paragraphs are applicable:
- a. Environmental conditions to be within design envelope.
 - b. Shiplift Facility must be materially available.
 - c. Nuclear submarine conditions to be within Shiplift Design Envelope.
 - d. Pre-operational checks must have been completed satisfactorily.
 - e. Suitably qualified and experienced operating staff available.
 - f. When lowering the platform to 2m/1m before 'float-off', the activities are similar to those for 'Raising the Platform to the Maintenance Level':
 - i. Raising the platform 'up off-pins':
 - 1. After the 'up off-pins' movement, the actual hoist profile must be compared with the expected hoist load profile and shown satisfactory before removal of the pins. To minimise any control and protection system failure the loads and hoists are specifically monitored at the 'up

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off pins' mode to ensure that all hoists stop within their timer setting and no hoists continue to raise beyond this point regardless of the multiple protection systems available. The 'levelling' button does not latch and has to be manually held on throughout levelling. Releasing the 'levelling' button stops the platform.

- 3127 With the platform levelled 'off-pins' and stopped, absence of brake common mode failure (CMF) is confirmed by comparing the actual hoist load profile with the expected hoist load profile.
- 3128 An additional operator confirmation that the pins are fully withdrawn is undertaken at both the SCR and by a visual inspection of all pin positions in the winchwells.
- 3129 The actions taken on receipt of a platform safety trip are controlled by EOP 976(N) (Ref. 32).
- 3130 Prohibited actions with the nuclear submarine above the point of grounding detailed at Paragraph 3112 apply in full. The following briefly describes the undocking sequence:
- a. Platform lowered to below transfer level to rig the berthing ropes.
 - b. Platform lowered to 2m/1m before float off to disconnect SW services and derig guardrails if not being done when afloat.
 - c. Platform lowered to full depth, vessel floats off whilst held by mooring ropes.
 - d. Brow and DEB rigged, S/M diesels started, electrical shore supply and comms disconnected.
 - e. VED opened, Roadbridge lowered to full depth, entrance cats positioned and vessel unberthed.
- 3131 When lowering the platform for unberthing, the activities are similar to those for 'Preparation for Grounding'. For Vanguard class, sliding blocks to be unlocked and opened as detailed in SOP 955(N) (Ref. 31).
- 3132 Unberthing the nuclear submarine and manoeuvring it from the Shiplift, is carried out as detailed in SOP 921(N) (Ref. 27).
- 3133 Once the nuclear submarine has left the Facility, the platform is raised and the cradle may be removed in accordance with SOP 961(N) (Ref. 36).

Shiplift EOT Crane Operation

- 3134 Operation is covered by SOP 943(N) (Ref.5), which is subject to approval by the DNSAG as detailed in their TOR. SOP 943(N) (Ref. 5) is issued and controlled in accordance with the Clyde Management System and is reviewed periodically, or when amended, by the DNSAG.
- 3135 The Dockmaster (Shiplift) (DM(S)) is responsible for the operation of the 55/2t EOT cranes and discharges his responsibilities in accordance with the Shiplift SOR (Ref. 19).



- 3136 All loads are moved using routes authorised by the DNSAG. Except during the placement of the submarine access brows, loads will not be manoeuvred over the South Quay. Movements of loads (except service and access brows) to and from the North Quay are subject to the following restrictions:
- Load movements over the hanger beams and winch chamber covers are prohibited outside of the set down and pick up areas, where lift height is restricted to a maximum of 0.5m.
 - Loads are delivered to the North Quay pick up and set down areas, and the only routes onto the platform are via designated cross-over points. Specified pick-up and set-down areas for the principal lifts of the 55/2t EOT cranes are identified in SOP 943(N) (Ref. 5).
- 3137 Crash mats of suitable construction are positioned on the platform such that they are adjacent to the hatch into which loads are to be deposited. All lifts higher than 1 metre over the platform take place over a crash mat. Fully substantiated crash mats are constructed in accordance with SOP 980(N) (Ref. 33) and are designed to protect the platform from damage caused by a Dropped Load (DL)/Uncontrolled Lowering of Load (ULL). Loads are lifted over the crash mats to a position just above the submarine casing, and are then positioned over the centre of the hatch. When the Crane Director is satisfied with the position of the load, it is lowered into the submarine and the slings are removed. The process is reversed to lift loads out of the submarine.
- 3138 To further avoid the possibility of dropped loads, a clear casing policy is adopted during the Dockings. The only equipment to be deposited on the docked submarines casing are items specifically authorised by the DNSAG e.g. the provision of Centre Fed Hosereels (CFHs) for firefighting.
- 3139 EMC/EMI Restrictions Prior to 55/2t EOT Crane Operation. - Prior to the 55/2t EOT cranes performing a nuclear lift, the following operating restrictions are to be implemented to safeguard against the hazard presented to the cranes by EMC/EMI. These operating restrictions are a pre-requisite of SOP 943(N) (Ref. 5):
- Electrical storms are not forecast during the EOT crane operation.
 - Welding machines are to be authorised by DNSAG prior to use.
 - Hand held radio transmissions are to be kept at least 0.5m away from the crane radio control system.
 - Vehicle radios are not to be operated if the radio control system is within 10m of a vehicle mounted radio transmitter (5m for critical operations).
 - Restrictions are to be enforced on Radar systems in accordance with Base Emergency Orders (Ref. ³⁹) and Clyde Management System Process Maps (CMSPM, Ref. ⁴⁰).
- 3140 Nuclear Lifts. - Lifts conducted by the Shiplift 55/2t cranes are classed as nuclear lifts in accordance with JSP 518 (Ref.1) from the time 'Hands to Berthing Stations' is piped until the order 'Hands fall out from Unberthing Stations' is given. Additionally, whenever a nuclear vessel is berthed at 12 Berth, lifts from the South Quay are classed as nuclear lifts to safeguard NSI services common to the Shiplift and 12 Berth.

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- 3141 Lifts conducted by the 12 Berth crane are classed as nuclear lifts whenever a nuclear vessel is alongside 12 Berth or in the Shiplift.
- 3142 Nuclear Check Lifts. - A nuclear check lift is performed prior to every nuclear lift. This consists of raising the load from the point at which it is to be lifted sufficiently to take its weight, whilst taking into account the need to keep the height to which the load is raised below 0.5m at its highest point. Additionally, the integrity and stability of lifting arrangement is checked by the slinger whilst the weight is taken by the crane. The maximum weight, lift duration and the check of the lifting arrangements are all recorded by the crane driver in the crane lift log in accordance with the requirements SOP 943(N) (Ref. 5).
- 3143 Nuclear Test Lifts (NTL). - It is recognised that in an operational base such as Faslane, where numerous lifts in support of nuclear submarines are made daily, it is not practical to carry out a NTL before each Nuclear Lift. The NTL is therefore conducted annually as part of the statutory test for each crane.
- 3144 Cranes and Lifting Appliances. - Cranes and lifting appliances used to make Nuclear Lifts, are required to be authorised for use by the Nuclear Services Authorisation Group (NSAG). Following the statutory testing of each crane or appliance (Shiplift EOT Cranes DSR (Ref.6), SOP 802(N) (Ref. ⁴¹) and SOP 942(N) (Ref. ⁴²) respectively) the NSAG issues a NTL certificate which specifies its maximum permissible Nuclear Lift capacity. The NTL certificate is valid for the duration of the Statutory Examination Certificate, unless any defect or maintenance affecting the lifting capability of either cranes is carried out (i.e. a component in the load path), in which case a further NTL is conducted.
- 3145 JSP 518 (Ref.1) requires the NTL to be at least 110% of the weight of the nuclear lift, including the weight of the lifting equipment. However, the safe working load (SWL) must not be exceeded for any NTL. Accordingly, the NSAG authorisation for a nuclear lift will be limited to 90% of the SWL. For a 55/2t EOT crane, main hoist authorisation would be for a lift of 49.5t. However the as-built structural re-assessment of the EOT cranes ability to accommodate normal operating and design basis faults has resulted in a marginal derating of their nuclear lift capacity to 47.8t (Ref. 6).
- 3146 Crane Directors. - The crane director is solely responsible for directing the crane driver during all operations. The responsibilities and duties of crane directors are specified in SOP 943(N) (Ref. 5). The crane director wears high visibility clothing in accordance with SOP 943(N) (Ref. 5). Only the recognised standard crane signals as defined in ISO/DIS 9925 (Ref. ⁴³) are used.
- 3147 Pendant Emergency Stop Operator. - A Pendant Emergency Stop Operator is provided under the control of the crane director. His sole function is to operate the emergency stop when necessary. The crane director must ensure he has communications with the Pendant Emergency Stop Operator at all times.
- 3148 Slingers. - All slinging operations/activities are undertaken by suitably qualified personnel.

Cooling Water Systems Operation

- 3149 Responsibilities. - The Docking Officer is responsible for co-ordinating all docking/undocking operations including the provision of cooling water in accordance



with the Shiplift SOR (Ref. 19). A full description of the SWC system is contained in the Shiplift Cooling Water Supplies DSR (Ref.3).

- 3150 Shiplift staff are responsible for the following:
- a. Carrying out routine monitoring of the Shiplift Cooling Water supplies to confirm integrity and availability of standby plant.
 - b. Carrying out routine checks on the Shiplift Cooling Water supplies to ensure that all necessary plant is correctly set up for its intended duty.
 - c. Operating the cooling water systems under normal conditions and in fault situations, whilst keeping within the NSRP functional constraints.
 - d. Restoration of Cooling Water supplies within the required grace time.
 - e. Connection of the FWWF system to supply essential cooling as required by EOPs and SOP 610(N) (Ref. 44).
- 3151 The maintenance authority is responsible to the FO for carrying out routine testing and timely maintenance of the Shiplift Cooling Water supplies, when required, to keep running plant in an effective and available state.
- 3152 Cooling Water Pre-Docking Checks. - The systems are configured and proven. Flooding bonnets fitted prior to berthing a submarine. Pre-docking checks are carried out in accordance with SOP 610(N) (Ref. 44).
- 3153 Prior to establishing sea water connections, communications are established between Shiplift Control Room, the submarine and the Diving Supervisor.
- 3154 Connection to Submarine. - All SWC water connections to the submarine in the Shiplift are made underwater by divers, under the control of Diving Supervisor, working in accordance with the relevant Shiplift procedures. Shiplift personnel ensure that sea water cooling is supplied when requested. HPDHR connections are made by Facility Manager Utilities and Processing (FMUP) personnel (SOP 920(N) (Ref. 21)).
- 3155 Frequent visual checks are carried out by Shiplift staff to ensure that the hoses connected from the North and South Quays are not over-tensioned, nor become snagged on adjacent structures during the raising and lowering process.
- 3156 Cooling Water Systems Operation. - The submarine monitors the flow of cooling water it receives whilst in the Shiplift. If any problem occurs, the submarine contacts the Duty Operations Engineer. The Duty Operations Engineer is responsible for initiating any necessary action. In an emergency, such as a hose burst or mains failure, (during or subsequent to raising of the platform) the system(s) will be re-configured and another hose/main brought into service.
- 3157 In the event of sea water level being forecast to fall below OD(N) -2.89m (as informed to the Facility Operator by Queen's Harbour Master (QHM)), the FWWF system must be available for supply to the HPDHR/EC tank. Once sea water level falls to OD(N) -2.89m, Shiplift staff stop the SWC pumps and provide cooling from the FWWF system in accordance with SOP 610 (N) (Ref. 44). The SWC pumps are re-instated, at the earliest, 1 hour after the low tide following -2.89m OD(N) is reached.

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- 3158 Lifts over cooling water supplies are not permitted in accordance with the EOT Crane DSR (Ref. 6).
- 3159 Cooling Water Disconnection from Submarine. - All SWC water disconnections from the submarine in the Shiplift are performed by divers, under the control of Diving Supervisor, working in accordance with the relevant procedures. Shiplift personnel ensure that sea water cooling water is shut off when requested.

CMA and STC Operations

- 3160 The CMA is where the individual strongbacks are positioned to form the relevant vessel's cradle. The cradle is assembled in sections (approximately 4 sections for a SSBN, 2 for a SSN and 1 for surface ships). The sections are transferred onto the STC, over small transition rails to bridge the gap, and the STC is then winched to align with the transfer apron in front of the Shiplift. Transition rails are positioned to bridge the gap between the STC, the transfer apron and the platform (at transfer level). The cradle section is pushed onto the platform using tow tractors. This process is repeated for each section. This operation is carried out in accordance with SOP 959 (N) (Ref.25) and SOP 960(N) (Ref. 45).

FACILITY OPERATIONS AT 12 BERTH

- 3161 The Facility Manager for the Shiplift is the FM for 12 Berth also. Operations at 12 Berth are conducted by Jetty Management Group (JMG) staff as detailed in the Shiplift Statement of Responsibilities (SOR) (Ref. 19).

Berthing Equipment

- 3162 Vessels use berthing ropes/hawsers of a size and composition dictated by their rigging warrant. Surface vessels will use rope of an appropriate diameter to their displacement. These ropes will either be provided by the vessel or by Shiplift Facility, if requested. Mooring arrangements for all vessels at 12 Berth are detailed in SOP 987(N) (Ref. 46), SOP 988(N) (Ref. 47), SOP 989(N) (Ref. 48), SOP 990 (Ref. 49) and SOP 991 (Ref. 50).
- 3163 The submarine/vessel CO is responsible for ensuring that the securing arrangement is adequately monitored and maintained, whilst the vessel is alongside.
- 3164 Berthing ropes are subject to periodic inspection by SQEP personnel, either from Ship's or Facility staff.

Catamarans

- 3165 The function of the catamarans and their mooring system is to provide fendering and support services between a berthed nuclear powered submarine and the jetty in all tidal states. The functional requirements of the catamarans are fully described and illustrated in the Northern Jetties Catamarans DSR (Ref. 51).

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- 3166 There are three catamarans at 12 Berth. Electrical and communications services are connected to each junction box and routed on support chains into cable troughs fixed in each catamaran deck from which they emerge to enter the underside of the respective SCBs. Electrical service booms positioned near the outboard edge of the catamaran provide further support for cables which are routed from the SCB to the submarine hull insert points in accordance with approved SOPs.

Primary Effluent Tank

- 3167 Submarine primary liquid effluent coolant discharges are made to Mk IV Primary Effluent Tank (PET). All PETs are required to receive, store and discharge contaminated liquid effluent in accordance with the principles of ALARP. PET details are provided within its supporting DSR (Ref. ⁵²).
- 3168 The Mk IV PETs are intended to be placed on the submarine casing via the 12 Berth 20t portal crane. Once discharge is complete the full PET is lifted from the submarine and transferred to the flatbed lorry for removal to the Radioactive Effluent Disposal Facility (REDF).

Note. The use of PETs whilst docked may be required to support removal of liquid effluent. The positioning of the PET shall be considered within the current scope of this FSC with regard to EOT Crane, clear casing and intrusive nuclear work restrictions.

Other Mechanical & Electrical Equipment

- 3169 The other services provided for 12 Berth Facility comprise the following:
- a. Fresh Water Supplies. - The fresh water supply to HMNB Clyde is supplied by West of Scotland Water from a single source, Loch Sloy, via 3- 1,855,000 gallon holding tanks in Glen Fruin by two means:
 - i. Twin supplies in the northern area.
 - ii. Twin supplies in the southern area.
 - b. FWFF. - FWFF water to 12 Berth is described fully in the Shiplift Cooling Water Supplies DSR (Ref.3).
 - c. Demineralised Water. - The demineralised water distribution system to 12 Berth is described fully in the Shiplift Miscellaneous Services DSR (Ref. ⁵³).
 - d. High Pressure (HP) Air, Low Pressure (LP) Air and Nitrogen. - Each of the gas systems, (HP air, LP air and nitrogen) serving the northern area receive supply via the processing plant within the NUB. Isolating and control valves are fitted throughout all the ring mains to allow continuity of supply in the event of maintenance or a fault occurring in a section of the supply main. The gas systems are described fully in the Shiplift Miscellaneous Services DSR (Ref. 53).
 - e. Diesel Fuel Oil and Lubricating Oils. - These are delivered to dispense points on 12 Berth via single line welded steel systems, fed from Garelochhead Oil Fuel Depot (OFD). Flexible hoses carry the services to connections on the submarine via service brows on each catamaran. These systems are described fully in the Shiplift Miscellaneous Services DSR (Ref. 53).

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- f. Other Gases and Services. - These include:
- i. Liquid nitrogen (cask) is delivered to 12 Berth as and when required.
 - ii. Hydrogen (bottled) is delivered to 12 Berth as and when required.
 - iii. Welding Gases. - Oxygen, acetylene, argon (bottled) are delivered to 12 Berth as and when required.
 - iv. Vessel sewage disposal, is carried out using removable disposal pipework from submarine to 12 Berth sewage pipework or via a sewage tanker from 12 Berth.
 - v. Disposal of compensating water from vessel fuel tank and Sullage (oily water) disposal is carried out using 12 Berth disposal system, or Sullage tanker from the Berth.
- g. Domestic Power Supply. - [REDACTED]
- h. Lighting (incorporating Blackout System). - [REDACTED]
- i. Cable Commercial Television.
- j. Crane Supply - 415V 3-phase 50 Hz.
- k. Earthing. - 12 Berth electrical installations are designed to provide a low impedance earth return path for fault conditions. In addition, provision is made at each sub-station to provide a local earth to safeguard personnel and to provide an earth connection to the following:
- i. 12 Berth electrical installations are protected against lightning strikes to BS 6651 (Ref. ⁵⁴).
 - ii. Transformer neutral points of each 50Hz voltage system.
 - iii. Apparatus framework and other non-current carrying metalwork associated with the electrical systems e.g. transformer tanks, steel cable trays, brackets etc.
 - iv. Extraneous metalwork not associated with the electrical systems. e.g. building steelwork, etc.
 - v. Fire alarms and linear heat detection (Shiplift Fire Protection DSR (Ref. ⁵⁵)).
- l. Cathodic Protection System. - 12 Berth forms part of the Shiplift structure and is described in the Shiplift Civil Structure DSR (Ref. 11).

Berthing and Unberthing

- 3170 Principles of Operation. - The control of berthing allocation and activities conducted alongside is effected by a number of forums, which bring together the necessary departments involved, as well as providing security. These forums cover long and medium term planning and day to day decision making.
- 3171 Allocation of Berth. - The process for berth allocation is fully described in the CMSPMs (Ref. ⁵⁶).



- 3172 Details of the restrictions pertaining to the berth status are referenced in the Port Operational Management Safety Report (POMSR) (Ref. 18).
- 3173 Berthing and Unberthing. - Berthing and unberthing activities are conducted under the control of the Berthing Officer in accordance with the following approved procedures (SOP 987(N) (Ref. 46), SOP 988(N) (Ref. 47), SOP 989(N) (Ref. 48), SOP 990 (Ref. 49) and SOP 991 (Ref. 50)). Admiralty Pilots provide tug control.
- 3174 Tug Control. - The provision of tugs minimises the collision hazard with a submarine alongside and the possibility of failure of shore supplies to a berthed nuclear submarine caused by a vessel collision initiating berthing line failure. It also minimises the possibility of damage to NSI services, e.g. catamarans at berths by 'heavy' berthing. (Note: 'Heavy' berthing relates to the possibility that, if the submarine was not controlled by the provided tugs then potentially higher speed berthing might occur with possible damage of catamarans and fenders). Nuclear submarines and other vessels berthing at nuclear berths or adjacent to nuclear berths are provided with tugs to either, secure to the vessel, to provide physical assistance, or to standby the vessel with the intention of providing assistance if conditions or circumstances demand, in accordance with the Port OMSR (Ref. 18).
- 3175 Securing. - Vessels and berthing rope configurations are contained in approved SOPs.

Crane Operations

- 3176 The definition of a nuclear lift is given in JSP 518 (Ref.1).
- 3177 The owner of the 12 Berth crane is the Facility Operator (DM(S)), who also manages its operation. The physical operation of the 12 Berth crane is conducted by Jetty Group Manager (JGM) staff who report to the DM(S).
- 3178 The department or vessel requesting the services of the 12 Berth crane is responsible for clearly identifying the task as defined in SOP 760(N) (Ref. 7) and requests are raised in accordance with the requirements of the HMNB Clyde Management System.
- 3179 Details of requirements for a nuclear lift, including maximum lift heights and restricted areas, are provided in JSP 518 (Ref.1) and SOP 760(N) (Ref. 7).
- 3180 Prior to the crane performing a lift, it must be in a fully operational state and the requirements outlined below must be achieved:
- Maintenance. – Missed or conceded maintenance for periods equal to or greater than 3 months is controlled in accordance with the requirements of the HMNB Clyde Management System in order to ensure that the design intent, nuclear safety and fitness for purpose of NSI facilities is maintained. For periods less than 3 months, concessions are controlled under local documentation arrangements.
 - Crane Faults and Damage. - Facility Operators & Maintainers are required to report any defects in accordance with the requirements of the Clyde management System. Defects are assessed at the regular NSI defect review meetings chaired by the Design Authority (DA). Any subsequent rectification work will be authorised by the NSAG.

- c. Control and Protection. - The crane control and protection are to be fully operational. Pre-operational checks on the control and protection systems are carried out as detailed in SOP 760(N) (Ref. 7).

EMC/EMI Restrictions Prior to 12 Berth Crane Operations

- 3181 Prior to a nuclear vessel approaching 12 Berth, the following operating restrictions are implemented as safeguards against the potential hazard presented to 12 Berth crane operation by EMC/EMI:
 - a. Hand held transmitters are not used within 0.5m of the crane control systems.
 - b. Vehicle transmitters are not used within 10m of the cranes.
 - c. Radio and Radar transmissions are restricted and controlled in accordance with the requirement of the HMNB Clyde Management System.
 - d. All personnel involved in the O&M of the 12 Berth crane are briefed on the restrictions imposed on items a, b and c above. In addition a warning notice is posted on the 12 Berth crane which displays these restrictions.
- 3182 Gale and Storm Warnings. - The crane driver is provided with the following information on actual and forecast wind speeds:
 - a. A daily forecast is provided via QHM to the Jetty Crane Manager (JCM).
 - b. A windspeed indicator and recorder is provided giving indication and an alarm in the drivers cab, with a second indicator fitted at the base of the jetty crane.
- 3183 The 12 Berth crane is capable of carrying out normal operations up to wind speeds as defined in the Shiplift 12 Berth 20t Crane DSR (Ref. 8). Cranes are withdrawn from service when these wind speeds are exceeded. When wind speeds exceeding crane operational limits are forecast as imminent (6 hrs) then JGM will inform users and DM(S) of the intention to withdraw the 12 Berth crane from service and the time by which this will be actioned in accordance with SOP 760(N) (Ref. 7).
- 3184 During high winds the crane is secured in its normal parked position (SOP 760(N) (Ref. 7)) and all storm anchors and brakes engaged. The crane is allowed to weathervane as defined in the relevant 12 Berth Crane DSR and in accordance with SOP 760(N) (Ref. 7). The crane jib is raised to the stowed position, aligned with the jetty track facing landward, the jib set at the radius and weathervaned in accordance with SOP 760(N) (Ref. 7). Having secured the crane, the crane driver reports to his supervisor.
- 3185 If the 12 Berth crane is not in operational service on receipt of a warning of a rising wind in excess of 30 knots, the crane is secured as detailed above. The crane can only be moved from its parked position on prior authorisation of the JCM.
- 3186 The 12 Berth crane is earthed through its structure which provides protection against lightning strikes. However, to prevent earthing through an attached load, the crane is taken out of service, where possible, when a thunderstorm is forecast. Nuclear lifts are not undertaken during a thunderstorm. If it is known that the 12 Berth crane has been struck by lightning it is removed from service until a full inspection has been carried out.

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- 3187 On completion of work, the crane is driven up to its respective long travel buffers where it is parked. The driver then aligns the jib with the crane rails, configures the crane for weathervane mode, isolates all power in the cab, locks all access doors and returns the crane keys to JGM staff (Ref. 7).
- 3188 In high wind conditions, the crane positive capture rail clamps are engaged and allowed to weathervane as detailed in the relevant DSR and in accordance with SOP 760(N) (Ref. 7).
- 3189 The crane is not left unattended in a nuclear exclusion area or the restricted areas identified in the relevant DSR and as detailed in SOP 760(N) (Ref. 7).

Explosives/Armaments Movements

- 3190 Explosive/armament movements, are controlled by the Clyde Management System. All Faslane berths have a permitted relaxation licence governing the quantities of explosive armaments which can be brought onto the berth out with approved magazines. All explosives/armaments stores movements are reviewed and approved before the event by the ESC, with the objective of minimising the impact of possible damage to nuclear safety support installations, equipment or adjacent vessels.

RADIOLOGICAL INVENTORY

- 3191 The only radiological inventory held by the Shiplift Facility consists of very small sources in fire detection equipment and certain electronic components, notably DIRAMS.
- 3192 The Shiplift Facility, including 12 Berth, has no requirement for the temporary or permanent storage of nuclear matter on the jetty structure or in the Shiplift. Any radioactive substances likely to be present, are there on an 'in transit' or 'work in way' basis; and will usually consist of one of the following:
- a. Materials on board a berthed submarine (entirely under the control of the ship staff).
 - b. Radioactive solids or effluent being discharged from a berthed submarine to the PET on the bed of a lorry, or to the PEB normally tied up adjacent to the submarine being serviced. Following discharge, the waste materials are moved from the Facility to the Active Processing Facility (APF) or REDF for processing/disposal. Discharge between submarine and PET is carried out under the control of ship's staff/REDF/APF staff working to relevant PAG/ NSAG procedures. The Facility Manager is notified of various radiological hazards transiting the Facility through Maintrol.
 - c. Radiation sources may be taken onto the Facility from time to time for the purpose of radiographing welds and for other inspection work as necessary. These sources will be entirely under the control of the contractor undertaking the inspection work and as such are governed by the requirements of the relevant HMNB Clyde Radiological Protection Standing Orders (RPSOs) (Ref. 52). X-ray generators may also be used for inspection purposes.



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- 3193 Due to the transitory presence of these radioactive materials it is not necessary to provide a detailed radiological inventory.
- 3194 The small sealed sources which exist in installed equipment are maintained consistent with the requirements of the IRR99 (Ref.⁵⁸).
- 3195 Other hazardous material stored or used within the Shiplift Facility is controlled in accordance with Health and Safety Policy within the Clyde Management System.

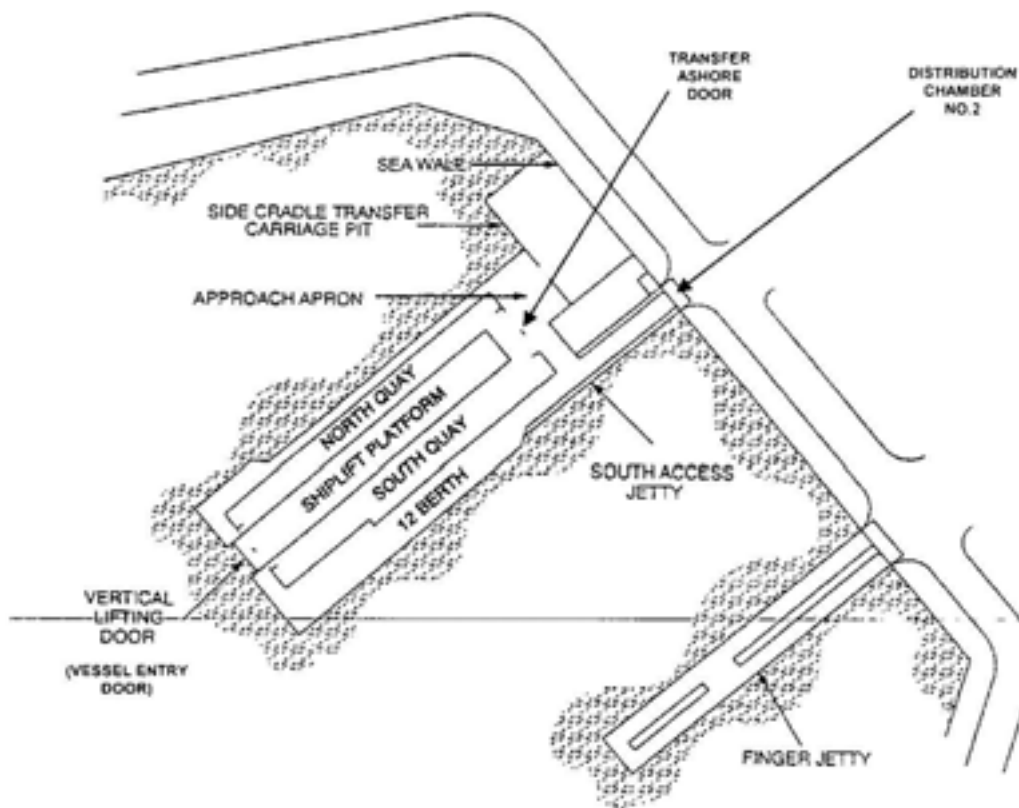


Figure 3.1 Shiplift / 12 Berth Location Plan



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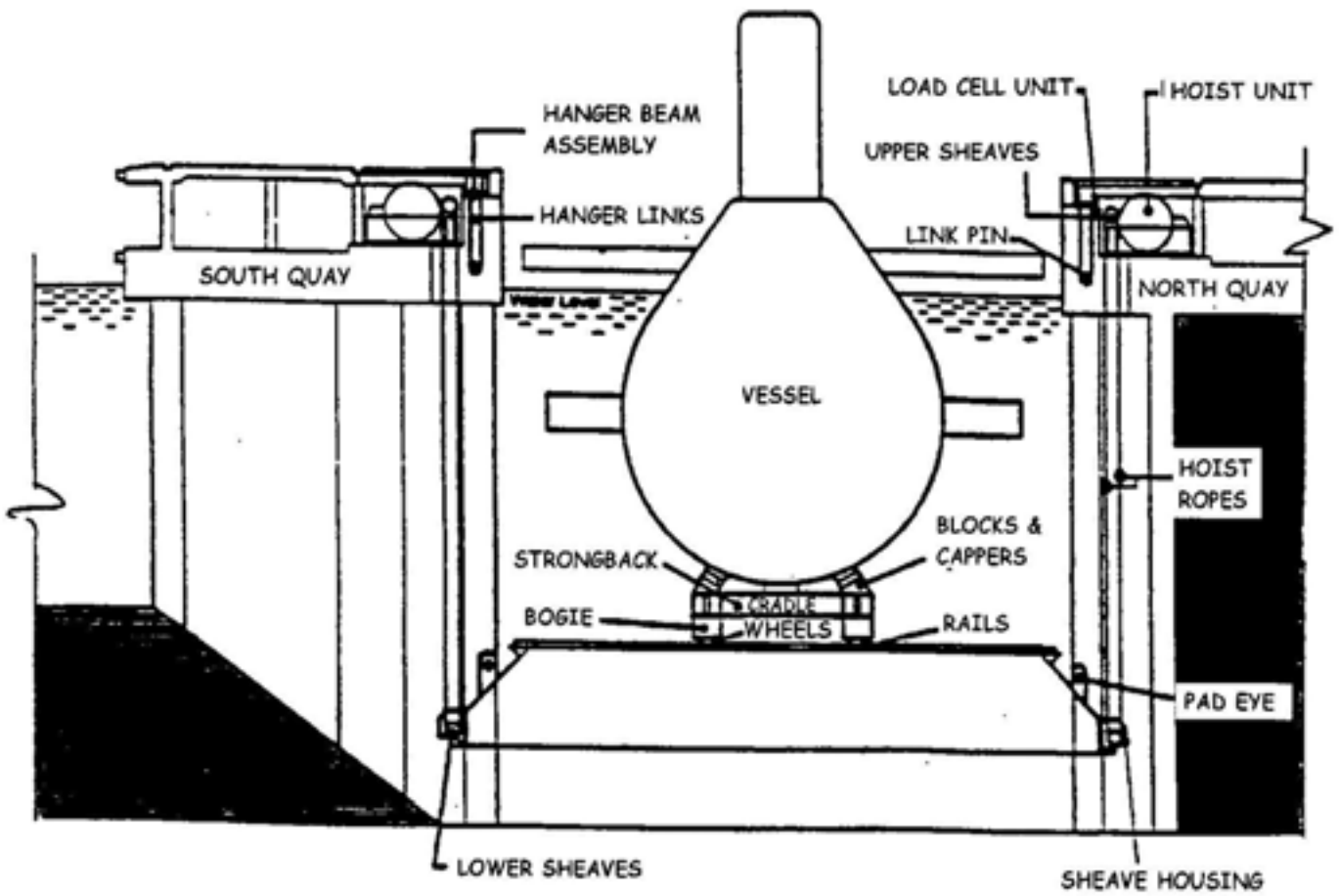


Figure 3.2 Sectional view of Shiplift with Vessel

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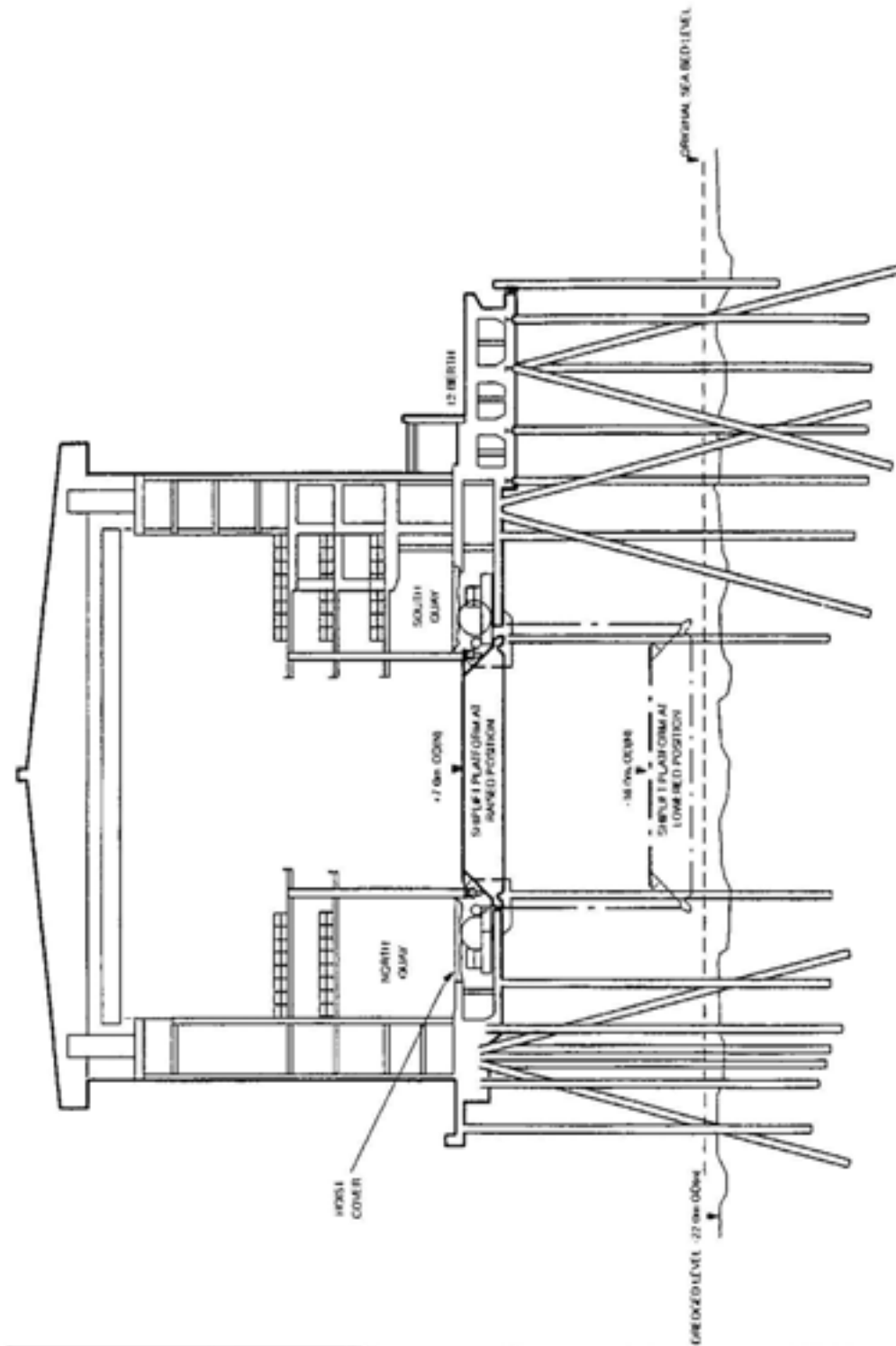


Figure 3.3 Elevation of Shiplift (Viewed from the Seaward end)

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REFERENCES

- | | |
|-------------------------------------|---|
| ¹ JSP 518 | Regulation of the Naval Nuclear Propulsion Programme Issue 2 |
| ² NBDD-PM-032 | Process Map. Administration of Nuclear Related Safety Mechanisms, Devices and Circuits. Rev. 2 |
| ³ N.2522.77 | Shiplift Cooling Water Supplies Design Safety Report – Issue 3. |
| ⁴ N.2522.60 | Northern Utilities Building Design Safety Report Issue 1. |
| ⁵ SOP 943(N) | Control and Operation of 55/2t EOT Cranes (A/B) located in the Shiplift |
| ⁶ N.2522.75 | Shiplift Electric Overhead Travelling Cranes Design Safety Report – Issue 3 |
| ⁷ SOP 760(N) | Operation of 20t Crane on 12 Berth |
| ⁸ N.2522.76 | Shiplift 12 Berth 20t Crane Design Safety Report Issue 3 |
| ⁹ N.2522.79 | Shiplift Platform Design Safety Report – Issue 3 |
| ¹⁰ SOP 932(N) | Platform Operations. Issue 03 |
| ¹¹ N.2522.78 | Shiplift Civil Structure Design Safety Report - Issue 2 |
| ¹² SOP 954(N) | Operation of Shiplift Vessel Entry Door & Transfer Ashore Door |
| ¹³ N.2522.61 | Faslane Communication Systems Design Safety Report - Issue 1 |
| ¹⁴ N.2522.62 | Faslane Northern Area DIRAMS Design Safety Report Issue 1. |
| ¹⁵ TR 3560 | Shiplift Berthing Equipment Design Report. |
| ¹⁶ N.2522.81 | Shiplift Fire Protection Design Safety Report – Issue 3. |
| ¹⁷ SHP-PM-011 | Identification, Qualification and Maintaining of Suitably Qualified and Experienced Personnel. |
| ¹⁸ N.2522.53 | Port Operational Management Safety Report – Issue 2. |
| ¹⁹ SOR-Shiplift/12 Berth | Facility Operator/Utility Manager. Dockmaster (Shiplift) - DMS. Shiplift & 12 Berth. Statement of Responsibilities. |
| ²⁰ CMS | Clyde Management System. |
| ²¹ SOP 920(N) | Docking of a Vanguard, Swiftsure or Trafalgar Class Submarine in the Shiplift. |
| ²² N2522.52/3 | Facility Safety Report, Conditions and Limits of Safe Operation – Issue 1 |

²³ SHP-PM-015	Process Map. Docking/UnDocking
²⁴ NSAG-PM-003	Process Map. Control of NSI Maintenance Concessions within HMNB Clyde
²⁵ SOP 959(N)	Assembly of a Docking Cradle in the Cradle Marshalling Area.
²⁶ SOP 962(N)	Calculation of Docked Submarine Strongback Loads Using Resilient Mount Compressions.
²⁷ SOP 921(N)	Undocking of a Vanguard, Swiftsure or Trafalgar Class Submarine in the Shiplift
²⁸ EOP 977(N)	Operation of a Vessel's Diesel Generators in the Shiplift under Abnormal Circumstances.
²⁹ S 2849 CSB Faslane	NEI Syncrolift including Operation and Maintenance Manual.
³⁰ 1350-221-R001	Shiplift Hazard and Operability Study
³¹ SOP 955(N)	Operation of Sliding Blocks.
³² EOP 976(N)	Platform Trips
³³ SOP 980	Crash Mat Construction using Crash Mat Modules
³⁴ SHP-PM-001	Process Map. Control of Work in the Shiplift Facility
³⁵ SHP-PM-008	Docks and Jetties Tag Out System.
³⁶ SOP 972	Operation of Mechanical Handling Equipment and Elevated Work Platforms on an Occupied Shiplift Platform.
³⁷ SHP-PM-013	Control of MHE and Self Drive Vehicles.
³⁸ SOP 961(N)	Marshalling of Shiplift Docking Cradle On & Off the Platform
³⁹	HMNB Clyde Emergency Orders.
⁴⁰ CMSPM	Clyde Management System Process Maps: a. HO-PM-002 Alongside Radio/Radar Transmissions (RADHAZ) b. HO-PM-003 Muzzle Hatch Movements c. HO-PM-004 Sonar Transmissions Alongside d. HO-PM-005 Conduct of Torpedo Water Shots Alongside e. HO-PM-006 Basin Trials Alongside f. HO-PM-007 Deconfliction and Promulgation of Ammunitioning Alongside (Faslane)
⁴¹ SOP 802(N)	Thorough Examination of Finger Jetty & 12 Berth 20 tonne Portal Jib Cranes
⁴² SOP 942(N)	Abnormal Operations for the Shiplift 55/2te EOT Cranes
⁴³ ISO/DIS 9925	Cranes and Lifting Appliances, Crane Hand Signals.



⁴⁴ SOP 610(N)	Operation of Seawater Cooling System for Shiplift and 12 Berth – using Hose Reels
⁴⁵ SOP 960(N)	Docking Cradle Alignment and Height Check on the Platform.
⁴⁶ SOP 987(N)	Berthing/Unberthing Vanguard Class Submarine HMNB Clyde Jetty
⁴⁷ SOP 988(N)	Berthing and Unberthing a Swiftsure Class Submarine at HMNB Clyde Jetty
⁴⁸ SOP 989(N)	Berthing and Unberthing a Trafalgar Class Submarine at a HMNB Clyde Jetty
⁴⁹ SOP 990	Hunt/Sandown Class Berthing/Unberthing
⁵⁰ SOP 991(N)	Visiting Ships Berthing – HMNB Clyde Jetties
⁵¹ N.2522.84	Northern Jetties Catamarans Design Safety Report – Issue 1.
⁵² N.2522.72	Primary Effluent Tank Design Safety Report – Issue 2.
⁵³ N.2522.83	Shiplift Miscellaneous Services Design Safety Report Issue 2.
⁵⁴ BS 6651	Code of Practice for the Protection of Structures against Lightning.
⁵⁵ N.2522.81	Shiplift Fire Protection Design Safety Report Issue 3
⁵⁶ CMSPM	Clyde Management System Process Maps: a. BO-PM-001 Berth Allocation – Planning Process b. BO-PM-002 Berth Allocation – ENEQ Considerations c. BO-PM-003 Berth Allocation – Out of Hours - Faslane
⁵⁷ SJ-BRSO-RPSO-001	HMNB Clyde Radiological Protection Standing Orders
⁵⁸ IRRs	Ionising Radiation Regulations 1999