Purpose/Requirement

This document has been developed to provide general details and information on the use of corrosion prevention/protection products manufactured by LANOTEC in the ANZAC Ship Project.

Use of these products will significantly reduce the incidence of corrosion on the ANZAC ships. This will considerably lessen the amount of rework and warranty claims presently being experienced and hence reduces cost. The reduction of corrosion will also present a better product to the customer. It is known that the corrosion on the ships already delivered has been detrimental to the image of the company as a quality builder. This is particularly so as the effects of the corrosion are clearly visible and tend to “catch the eye”.

ASP – Corrosion Prevention and Protection of Equipment

ANZAC ship equipment has been prone to high levels of corrosion both prior to delivery and after. The main contributing factors for this are;

a. equipment (from subcontractors) manufactured from materials not able to withstand the operating environment (despite the fact the fact that most subcontracts specify various “corrosion resistant” requirements,
b. dissimilar metals in contact causing accelerated corrosion by galvanic action (a typical example is aluminium alloy equipment secured to ship structure by mild steel stud and stainless steel fasteners,
c. corrosion induced and accelerated by drilling/grinding/welding residue remaining on installed equipment for long periods,
d. equipment left open for long periods and unprotected from the elements during installation,
e. poor work practices including assembly of unpainted/inadequately prepared (and sometimes already rusted) ship pieces and equipment, and
f. denial of any corrosion problem resulting in no effort (or responsibility) to investigate or determine a cost effective solution and correct/amend work practices.

Protection of equipment after installation has proved on the whole ineffective particularly from further ship build activities involving cutting, grinding and welding. The taped on corrugated sheets either fall off is not replaced or is not put on to start with due to difficult equipment shape and/or position. In some cases covering with plastic sheeting has accelerated corrosion by sealing in moisture.

Lanolin based products such as the LANOTEC range have effectively only been on the market since 1998. Prior to this ready availability (at a cost effective price) of lanolin based corrosion protection products there was no other products that were;

a. safe, non polluting, clean to use and easy to apply, and
b. long term effective in a harsh marine environment.
Cost Effectiveness of Using Lanotec Products

The products are relatively low cost and the time taken to apply is minimal. The cost savings due to reduction in rework are expected to be considerable. Lanotec products are “clean and user friendly” compared to mineral based corrosion prevention products that are really not effective.

The cost that has been previously incurred by Tenix due to replacement of equipment and rework would be difficult to determine but must be substantial.

OH&S and Environmental Considerations

There are minimal OH&S and Environmental issues. This is supported by data in the attached Information & Material Safety Data Sheets and the Environmental Health Risk Assessment Report.

Lanotec Product Range

**Type A grease**: Lanolin based grease. Available in 250 ml, 500ml, 1, 4, 10 & 20 litre containers.

**GP21 (General Purpose) & HD21 (Heavy Duty)**. Lanolin based liquid. Liquefied with a non-regulated, evaporative paraffinic hydrocarbon carrier. Available in 1, 5 & 20 litre containers. GP21 is also available in 300ml-aerosol can.

**Citra Force**: A natural citrus based de-greaser and cleaner. Recommended to be used to remove the lanolin based products. Available in 1, 5, 20 & 200 litre containers.

Lanolin Based Products – Feature, Data and Benefits

<table>
<thead>
<tr>
<th>Features</th>
<th>Data &amp; Benefits</th>
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<tbody>
<tr>
<td>Repels water &amp; moisture</td>
<td>Ideal in harsh industrial &amp; moist/humid environments. Clings to metal &amp; alloy surfaces. Aids in making smooth surfaces non-slip when wet.</td>
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<tr>
<td>Penetrates and lubricates</td>
<td>Use as an anti-seize and cutting agent, penetrates down to “inaccessible” spots.</td>
</tr>
<tr>
<td>Will protect many non-metallic materials and will not perish rubber or plastics.</td>
<td>Can be applied to rubber (including O-rings), vinyl, plastics, timber, leather and canvas.</td>
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Note: The lanolin liquids and grease can be buffed or polished where required to remove any “tackiness” after the carrier agent has evaporated.

**GP21, HD21 and Type A Grease – Technical Qualifications**

**Salt Spray Resistance** – meets AS 2331.3.1

**Acid and Alkaline Resistance** – meets AS 1580.460.2

**Water Displacement** – meets MIL-C-23411.3.6

**Residual Contamination** – conforms to USEPA guidelines

**Electrical Resistance** – Conductive resistance tested to 70KV

**Flame Enclosures** – Test of Greases to Clause 4.2 of Australian Standard AS 2380.2 – 1991 (including Amendment No 1, July 1992)

**Use of GP21, HD21 and Type A Grease**

Ensure all surfaces are clean and dry before application. Application is easier when equipment/surface is warm (warmed by sunlight suitable).

Can be applied to paint surfaces and then buffed or polished to remove any surface tackiness. Can be applied to rubber, vinyl and plastics. Allow approximately 60 minutes for product to penetrate/seal surface completely and for the solvent carrier to evaporate before use.

Remove any rust or scale from metal surfaces. GP21 and HD21 can be used as a penetrating and cleaning agent.

Ensure there is adequate ventilation when applying to large areas such as tanks and voids.

**Methods of Application – GP21/HD-21 Liquids and Grease**

Can be applied using a brush, roller or sprayed. Spraying can be accomplished using a machine type paint sprayer or a manual trigger spray bottle applicator. Where necessary the treated surface can be buffed/polished with non-synthetic cloth or rags.

Lanolin grease is most easily applied using a brush.

**Use in Confined Spaces**

Ensure there is adequate ventilation.

**Recommended General Applications for Electrical/Electronic Equipment-ASP**
Apply to the following types of equipment/items mounted in corrosion prone areas (weather/upperdecks and machinery spaces):

a. all sound powered equipment mounted in exposed positions, weatherdecks and machinery areas,
b. all ships telephone equipment in exposed positions and machinery spaces,
c. all electrical switches, sockets, pushbuttons and the like in corrosion prone areas,
d. most electrical light fittings,
e. communications equipment antennas/aerials and associated antenna tuning units or matching transformers,
f. all alarm broadcast speakers and remote control stations in corrosion prone areas,
g. Tactical Intercom (TI) equipment such as remote user stations,
h. Upperdeck enclosures for sound-powered/ships telephone and Tactical Intercom equipment.
i. all steel wire shock mounts and earth straps,
j. Combat system equipment such as directors and antennas (TIR, FCS, ESM, CESM),
k. CCTV flight deck camera.

This list is not extensive. Specific equipment and applications will be detailed in other documents in due course. It is also intended to incorporate use of these products into the work orders.

**Application to Live Electrical Equipment**

Lanotec has been tested to for conductive resistance to 70KV. Power to equipment however must be isolated before application. After application allow approximately 10 minutes for the solvents (hydrocarbons) to evaporate before reapplying power.

**Recommended General Applications for Mechanical Equipment and Structure**

All mechanical equipment in corrosion prone areas as applicable should be treated. The following equipment has been particularly susceptible to corrosion:

a. boat crane
b. upper deck fire hydrants
c. focsle fitted equipment
d. doors and fittings,
e. deck plugs,
f. winches.

All steel wire shockmounts should be treated with HD21 heavy duty liquid lanolin particularly those in machinery spaces that are subject to not only to salt humidity but also corrosive vapours. Application of the liquid at the time of installation will also prevent penetration of the wire strands by welding or grinding cutting residue and hence prevent premature failure.
Void spaces in areas such as machinery compartments should also be coated with HD21.

**Adhesion of Lanolin in Salt Water**

A recommended use of heavy-duty lanolin liquid and lanolin grease is for application to ship hulls and propellers. Lanolin is not an anti-fouling agent and vessels that are moored for extended periods obtain no benefit. It assists however by making the removal of marine growths and organisms easier as well reducing hull friction and hence improving glide through the water.

A report is available on the use of lanolin on the hulls of fast passenger ferries where the lanolin is still adhering after three months of use.

**Removal of Lanolin**

All traces of lanolin liquid or grease can easily be removed by using diluted Citra Force cleaner/degreaser.

**Paint Adhesion and Cleaning Prior to Painting**

No specific paint adhesion tests are available. Mineral based paint may be applied to surfaces coated with lanolin with no apparent loss of adhesion properties. Where the lanolin has been applied thickly or on a continuous basis it is recommended that the surface be cleaned using diluted Citra-Force cleaner. Light overspray may be painted over with no need to clean.

**Application During Build and After Fitting**

The best results will be obtained if the lanolin is applied before or while the equipment is being fitted. This will allow all surfaces of the item to be coated. In some cases the equipment could/should be prepared in the workshop before being taken to the ship for fitting. This procedure will not only provide the corrosion inhibition but also protection from welding spatter and cutting/grinding residue. Much of the corrosion damage is accelerated or induced by build residue.

Where equipment is already fitted as is the case on ships 06/07 the application by necessity will be in-situ. Where any equipment has been removed due to corrosion as is the case on ship 07 then the replacement or refurbished item should be treated prior or during replacement.

In view of the time between fitting of equipment and delivery the equipment should be examined at six monthly intervals and lanolin should be re-applied if required.

A maintenance program will require development to ensure that all applicable items/equipments are identified and a simple application procedure produced. Some equipment such as sound powered telephones that are mounted internally will only require application once (ie during fitting). Once the ship is delivered RAN programmed maintenance procedures incorporating the use of lanolin will preserve this equipment.
**OAAP Review – Corrosion Problems**

The Operational Availability Assessment (OAAP) Review identified failures induced by corrosion and water ingress particularly in communications equipment fitted externally. For this equipment the solution advised was to amend the existing RAN procedures where applicable to incorporate the use of lanolin based products. This solution has been accepted. This will reduce the number of spares to be procured by Tenix to a minimum.

**Interaction and Advice to the Project Authority (PA)**

The Project Authority should be advised formally of the intention to use lanolin based products and invite their comments/input. Copies of the various reports and data sheets are available and could be forwarded.

It is understood however that the RAN is already using to a limited extent some lanolin products (on HMAS Jervis Bay – the aluminium hulled fast catamaran).

**Future Development of ANZAC PMD**

Existing delivered PMD for clean and inspect of equipment such as antennas, telephones, speakers, directors and cameras is basically a fresh water wash down. This has proved of course ineffective in prevention of corrosion.

Some PMD will be amended at Tenix cost as a result of the OAAP to incorporate the use of lanolin. There may be an opportunity in the future however to offer the PA (costed CAP) amended PMD for all equipment that would benefit from application of lanolin. It could reasonably be assumed that once lanolin is introduced for some equipment the effectiveness would be noted and a requirement would flow on to other equipment and applications.

**Potential Future Tenix Work**

Tenix could consider preparing an ANZAC ship “corrosion control/prevention” package to offer to the Navy. This package would include;

a. survey and inspection,
b. prepare/clean and treat with lanolin, and
c. provision of a report.

The package would cover not only the applicable fitted equipment but would also include structural parts and spaces. The package could also “pick up” RAN PMD and reduce the workload on ship and support personnel.

**Presentation of Lanotec Products**

A presentation of Lanotec Products was held on site in September 2001. Various ASP personnel attended this presentation. Personnel included;
The presentation was conducted by Geoff Boyle of Lanotec and included a tour of ship 06.

The products were assessed as excellent and if used would result in substantial cost saving benefits in the ASP.

Personnel from PMO were advised and invited to the presentation however none attended.

TRIAL/TEST ON SHIP 06

GP21 liquid lanolin was applied to the following item/equipments on 21/09/01. The equipment was inspected on 15/11/2001.

a. Equipment/Description (BHA):
SOCKET WALLMOUNT S/PROOF STORMGREY PN215-507100 (9005654462)
SHIP TO SHIP CONNECTION BOX STORM GREY PN215400100 (9005386637)

Position:
Focsl port side mounted on superstructure.

Condition prior to application of liquid lanolin and remarks:
Light/medium level of corrosion evident on socket connector and dust cap. Light rust markings on paintwork caused by cutting/grinding residue. Evidence of corrosion on earth strap and attaching hardware. GP21 cleaned most of the rust markings off.

Condition on 15/11/2001:
Condition excellent, no evidence of corrosion on connectors. Paint surface protected from further damage. Dust caps easily removed by hand.

b. Equipment/Description (BHA):
ENCLOSURE FOR SOUND PWD & TACT REMOTE USER STATION (905146877A)– CONTAINING;
i. Call Select Module (CSM)
ii. TI Speaker Module (TSM)
iii. Sound Powered Telephone (SPT)
ENCLOSURE FOR COMMAND & CONTROL STATION (9051319097) – CONTAINING;
i. Broadcast and Alarm Speaker Module (BASM)
ii. Broadcast and Alarm Control Module (BACM)
SOCKET WALLMOUNT S/PROOF STORMGREY PN215-507100 (9005654462)

Position:
Port Bridge Wing

Condition prior to application of liquid lanolin and remarks:
Light/medium level of corrosion evident on socket connectors and dust caps. Light rust markings on paintwork caused by cutting/grinding residue. Evidence of corrosion on earth strap and attaching hardware. GP21 cleaned most of the rust markings off. Enclosure 905146877A heavily damaged internally by rust and will require corrective action.

**Condition on 15/11/2001:**
Condition excellent, no evidence of corrosion on connectors. Paint surfaces and cables handset etc protected from further damage. Dust caps easily able to be removed by hand.

c. Equipment/Description (BHA):
MORSE KEY (9005001569)
FOGHORN PUSHBUTTON WING (9005048926)

**Position:**
Port Bridge Wing

**Condition prior to application of liquid lanolin and remarks:**
Light corrosion with green verdigris. Corrosion evident on securing hardware with potential to readily cause seizing of machine screws. Surfaces marked by rust from grinding residue. Items basically manufactured from brass with a rough finish. Lanolin cleaned off rust marks and sealed surface.

**Condition on 15/11/2001:**
Condition excellent. No evidence of verdigris. Surface protected from further rust and corrosion damage.

d. Equipment fitted on Starboard Side Bridge Wing.
The equivalent equipment fitted on the starboard side bridge wing was not treated. This equipment is showing increased levels of corrosion and rust damage. Connectors and dust caps are showing considerable evidence of corrosion with the dust caps now difficult to remove by hand.

**Ship 07 Superstructure Fitted Equipment**
All the external sound powered telephone sockets, power sockets, light switches and ship/ship telephone connection boxes were severely corroded and had to be removed and returned to WC05. The superstructure was shipped from NZ with this equipment not protected from the elements.

Approximately 60 items required to be removed. Most of these items were scrapped. The initial estimated replacement cost was $50,000 but may have exceeded this.

Lanolin liquids would have if applied at the time of installation provided the level of protection needed and avoided the replacement and rework costs.

**TDS CATALOGUE Numbers and Prices**
(prices as advised by Coventry Fasteners 15/11/2001)
GP1, General Purpose Liquid Lanolin GP21 – 1litre. CAT No:9051979231
(approx cost $15-90 excluding GST)

(approx cost $57.00 excluding GST)

GP20, General Purpose Liquid Lanolin GP21 – 20 litre. CAT No:9051979243
(approx cost $225.00 excluding GST)

PP300, General Purpose Liquid Lanolin GP21 – Pressure Pack 300 gm. CAT No:
9051979255 (approx cost $8.40 excluding GST)

HD1, Heavy Duty Liquid Lanolin HD-21 – 1 litre (steel can screw lid) Not
catalogued. (approx cost $17.40 excluding GST)

HD5, Heavy Duty Liquid Lanolin HD-21 – 5 litre (steel can screw lid) CAT No:
9051979206. (approx cost $69.70 excluding GST).

HD20, Heavy Duty Liquid Lanolin HD-21 – 20 litre. Not catalogued (approx cost
$259.40 excluding GST).

GSA500, Type A Grease 500ml (plastic can, screw cap). CAT No:9051979218.
(approx cost $9.70 excluding GST).

CF5, Citra-Force Citrus Cleaner/Degreaser – 5 litre (steel can screw lid). CAT No:
9051979218. (approx cost $37.00 excluding GST).

(approx cost $3.00 excluding GST).

Local Availability

All products stocked by Coventry Fasteners (Altona Branch). Coventry Fasteners are
a major supplier of fastening products to the ASP.

OH&S Authorisation

The OH&S authorisation for use and purchase of LANOTEC grease, liquid and
cleaner is 047/01.

Attachments:

a. Lanotec Australia – Information & Material Safety Data Sheets
b. Test Report – Test of Greases to Clause 4.2 of Australian Standard AS
c. Lanotec Application Guides.
d. Salt Spray Testing of Lanotec and Other Products Applied to a Variety of
Metal Surfaces – Report No: QRH99-0094 (LANOTEC/ETRS document)
e. Salt Spray Testing of Lanotec Products Applied to a Galvanised Bolts –
Report No: QRH99-0094-02 (LANOTEC/ETRS document)
f. Chemical Stability Test of Lanolin Based Product (Report No: QRH01-4312).
g. Queensland Health - Environmental Health Risk Assessment.