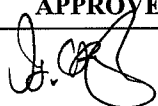


| Originating 58384 | | REVISIONS | |
|-------------------|---|-----------|---|
| REV | DESCRIPTION | DATE | APPROVED |
| A | Added 1.1.5 and updated egg crate material requirements. Added pictures of proper boxing of egg crates per DCR 58480. | 5/16/2011 |  |

QUALITY SPECIFICATION

| | | | | | | | |
|-------------------|-----|----------|---------------------------------------|-------|-----------------|---------------|---|
| APPROVALS | | DATE | Marathon Norco Aerospace Incorporated | | | | |
| ORIGINATOR GLB | | 12/28/10 | WACO. TEXAS | | | | |
| CHECKED | | | SUPPLIER PACKAGING REQUIREMENTS | | | | |
| APPROVED | | | SIZE | FSCM | DWG NO QS-36446 | REV | A |
| DIST. CODE | 14A | | A | 74025 | | SHEET 1 OF 24 | |

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1.0 Packaging---General.

- 1.1 The Supplier is responsible for utilizing packaging methods which ensure the products supplied to Marathon Norco Aerospace Inc. (MNAI) arrive and can be handled at the MNAI facility in the same quality condition in which they were manufactured. MNAI will not accept defective products or part shortfalls attributable to manufacturing, packaging or shipping methods which can be prevented with good, consistent processes and procedures.

Note: The terms “product, part, hardware, item, assembly” may all be interchangeably used to denote the object being packaged.

- 1.1.1 Boxes for shipping: Shall be of sufficient wall-thickness and strength to ensure adequate protection of parts. Boxing shall be new, except for those packaging/boxes which are identified as reusable containers, and they should be used until their capabilities for securing and preserving the product(s) are no longer adequate.
- 1.1.2 Packaging material: Materials used to package shall be those listed in subsequent paragraphs. As an example, for tubes and round parts, cardboard tubing shall be used as displayed in Section 2. Any material used for product wrap, separation, containment, thread preservation and integrity, etc. which could cause Foreign Object Debris (FOD) damage or part contamination, part obstruction or leave preservation residue is prohibited.
- 1.1.3 Product features: Small functional passages, such as holes and segments, shall be packaged to positively exclude any and all packaging material that may contaminate, plug or fill the passages, holes or openings. Certain fiberboard boxes shed significant amounts of fiber dust during transportation and handling. In certain cases, the Product may need to be identified and packaged individually, in dust-excluding bags, before being placed in multiple-compartment fiberboard containers or individual fiberboard containers.
- 1.1.4 Staples are prohibited for all package closures.
- 1.1.5 Where no specific packaging instructions exist, then it is expected that the industry best practice for packaging shall be used.

1.2 Egg Crate Type Packaging Material

- 1.2 Fiber/Cardboard packaging material in the form of egg boxes, egg crate trays are unacceptable. Egg Crate boxing is acceptable if it is made from a plastic material. Parts shall be small enough to securely fit within the egg crate depressions. Parts shall fit securely in the egg crates without protruding. Multiple egg crates shall be shrink-wrapped together to retain parts.

1.3 Bags, Part Wrapping and Damage Proofing

- 1.3.1 Cushioned bags, such as Jiffy Bags, (padded self seal mailers), may be used as the one-each unit pack for robust items only. Cushioned bags shall be cushioned with fibrous material.
- 1.3.2 Other bags (polyethylene, barrier material, or paper) may be used as the one-each unit package for certain small parts and/or for preservation purposes. For large volume packaging of certain rugged, low value hardware, such as Class C parts, the use of Auto Baggers or similar semi-automated bagging and bag imprinting (100.1.4) equipment has been shown to be economically justifiable based on:
 - 1.3.2.1 Increased speed
 - 1.3.2.2 Reduced material cost
 - 1.3.2.3 Identification (finished part labeling) directly on the bag
- 1.3.3 Bags or “wrap-alone” generally will not provide adequate product/ part protection, and shall not be used as the sole means of packaging. Bags or wrap-alone are not appropriate if the product is fragile. With fragile product/hardware, the bag may be used as the unit package, and then additional forms of packing material would be required such as folding fiberboard containers, jiffy bags or plastic boxes. These, in turn, must be packed in a sufficient shipping container. **When in doubt, over-package!**
- 1.3.4 Transparent bags made of polyethylene, or similar water-vapor transmittable materials, may only be used for product/parts that are non-metallic and not subject to corrosion. Polyethylene bags will “sweat”, particularly if heat-sealed and thus may cause corrosion of metallic parts. Plastic bags may be acceptable for such hardware if a desiccant bag/materials contained within the plastic bag.
- 1.3.5 Sealed bags, needed for hardware that is corrosion-prone, shall be made of appropriate barrier materials and appropriately fabricated. If sealed bags are not required, do not staple the bag closed, nor staple the I.D. tag to the bag. The bag design must provide MNAI applicable access for inspection and associated reuse.
- 1.3.6 Most corrosion-prone items shall be wrapped or bagged as required herein. The wrap or bag shall maintain cleanliness as well as support preservation. When wrapping is an option, “Grade A” grease proof paper is the preferred material.

- 1.3.7 The majority of non-corrodible hardware can be wrapped in polyethylene sheet foam, Kraft paper, or bubble wrap. Do not use excessive wrapping. Do not use clear tape with bubble wrap or similarly light white colored foam sheets.
- 1.3.8 Wrapped, packaged and identified parts shall be containerized in a manner which is “mistake-proof” in that they will not be damaged when opened with a utility knife. For purposes of providing re-closeable and identifiable unit packages, wrapped parts should not be considered a one-each unit package.
- 1.3.9 Trash bags, Kraft paper grocery bags and bubble bags shall not be solely employed for packaging. Any use of the above bags must be put into an approved container such as an over-pack box before being shipped to the recipient.

1.4 Volatile Corrosion Inhibitor (VCI) Materials

- 1.4.1 Metallic product/items made from materials such as 400 Series stainless and carbon alloy steels or ductile iron castings (those that corrode readily) shall be thoroughly cleaned and all fingerprints or surface chemicals neutralized. Volatile corrosion inhibitor paper conforming to **MILP-3420 MIL-B-22019** or **MIL-B-22020** will provide good protection to ferrous and aluminum parts-and shall be used accordingly.
- 1.4.2 Wrapping the product/part and securing the package closed with tape to prevent accidental opening and associated exposure of the product/part to ensure adequate protection is expected. Sealing of the package may not be necessary, provided the part is fully enclosed in the paper.
- 1.4.3 VCI shall not be used to protect product/assemblies containing optical systems or other precision moving parts which have already been coated with a preservative or lubricant, in accordance with **MIL-I-8574**.

VCI **shall not be used** with parts and assemblies containing zinc plating, cadmium zinc-base alloys, and alloy of other metals (including solders and brazing alloys) containing more than 30% zinc or 9% lead in accordance with **MIL-I-8574**.

- 1.4.4 In all cases, direct contact with non-ferrous metals, except aluminum and aluminum-base alloys, shall be avoided in accordance with **MIL-I-8574**. Assemblies containing plastic, painted, or rubber components shall not be packaged with VCI unless the Supplier has determined that the particular inhibitor will pass the compatibility test specified in **MIL-I-8574**.
- 1.4.5 If VCI is used, liquid contact preservative (oil) shall not be used.

1.5 Protection of Openings, Internal Threads, Studs, and Protruding Pins

- 1.5.1 All protective devices shall be very obvious to MNAI and the eventual end-user, and shall be error-proof. Protective devices shall be of a design which

absolutely prevents ingestion of FOD or ingestion of the device itself into the part. If the protective device is placed deep within the product, the protective device shall be made apparent by a tag, a pull-string or other apparatus to ensure the knowledge of the buried device is obvious.

- 1.5.2 All openings, internal and external threads, studs, and pins shall be protected from damage by using plastic or metal caps (preferably yellow in color), or by other appropriate methods, which will provide continued protection when the product/part container has been removed.

- 1.5.2.1 **Note:** Never use protective material of the same or close color as the product/part. All openings that may provide an entrance for contamination or foreign object debris (FOD) shall be protected in a manner which will preclude ingestion of foreign matter.

1.6 Cushioning and Dunnage Thickness and Density

- 1.6.1 Cushioning and dunnage thickness and density: To ensure product/part protection during shipment, variables such as part size, shape, surface protection, weight, fragility, surface features, the number of pieces being shipped, etc.-----all will need evaluation. These requirements shall apply to the exterior container, intermediate containers and the unitpack container.
- 1.6.2 Acceptable methods of cushioning include, but are not limited to: foam-in-place, polyethylene foam and polyurethane foam.
 - 1.6.2.1 Foam-in-place or die cuts: Full foam or dunnage encapsulation, with split-line for opening, is acceptable. Foam caps or end cushions (only) are not acceptable. Dunnage boards are also not acceptable.
- 1.6.3 Heat sensitive parts shall never be directly foamed-in-place. Pre-molded foam in place, which is allowed to cool, with-out the product, before packaging, is acceptable. No foam in place material shall be on the exterior of containers.
- 1.6.4 Foam-in-place cushions shall be dedicated for use and scrap foam shall not be used.
- 1.6.5 Foam-in-place applied correctly can be an acceptable method of part protection; incorrectly done it can put the part at risk of damage.
- 1.6.6 For foam operations, the proper application is to use a “top and bottom bun configuration”, with an asymmetrical configuration if at all possible. The foam buns should center the product/part in the container and be thick enough to protect the product/part in case the over-pack package is dropped or crushed in shipment. The buns should be easily removable from the product/part, and shall never leave any residue on the part. The buns should fit snugly in the applicable shipping container and prevent movement of the part.

1.7 General Thickness Requirements:

- 1.7.1 For small, light-weight items, a cushioning and/or dunnage thickness of two(2) inches all around the product is the minimum acceptable.
- 1.7.2 The larger, heavier, or more complex the product/part, the more cushioning and/or dunnage thickness required. As a rule of thumb, parts weighing between 5 to 20 pounds (2.3 to 9.1 KG) each, with no sharp edges, should have a minimum of 3 inches of cushioning/dunnage on top, bottom, and all sides. If foam is used, it shall have a density of at least 0.4 pounds or 18 KG per cubic foot (PCF). If sharp edges exist, use at least 0.75 PCF foam and soften sharp edges with dunnage or wrapping (blunting). Preference would be all sharp edges and protected further with cardboard or other prior to the use of the foam surround.
- 1.7.3 For parts above 20 lbs./9.1KG each (or lighter parts with sharp edges), use at least 3 inches of cushioning/dunnage. If foam is used, it shall have at least 0.75 PCF density, or higher, on all sides.
 - 1.7.3.1 For special or difficult applications, such as high weight and sharp edges, or high weight and low part surface area, use a minimum of 3 inches of cushioning/dunnage. If foam is used it shall have 2.0 PCF density or higher. Notwithstanding, absolute attention is to be applied to all sharp edges to ensure their natural tendency to "cut" does not happen during shipment.
- 1.7.4 Foam-in-place with high-pour temperatures must be pre-poured and allowed to cool or have top and bottom buns separated with paper to prevent heat welding.
- 1.7.5 Crispy foam texture indicates improper pour conditions.
- 1.7.6 OTHER FOAM OR BUBBLE WRAP
 - 1.7.6.1 Other (than foam-in-place) foams or bubble wrap shall be applied as appropriate to the weight and fragility of the item. Except for small parts, the above thickness requirements shall generally apply. Thermal bonding is required for polyethylene foam laminations and joints. Glue bonding of foam is prohibited unless certified glue release temperatures exceeding 150 degrees F can be achieved.

1.8 Cylindrical Parts:

- 1.8.1 Aluminum and or Steel Cylindrical parts: Shall be placed inside the appropriate size card board tube (see Section 2) of sufficient length to adequately cover the end of the product/part and have the plastic end-caps secured in place. Sufficient Dunnage shall be placed on the ends to keep the parts from sliding in the tube and scratching or otherwise marring the surface finish. Cylindrical aluminum and or steel parts with threaded ends shall have thread protectors installed. If the

supplier identifies the tubes, Marathon Norco will return the reusable tubes to the applicable supplier.

- 1.8.2 Aluminum and or Steel Cylindrical parts with hinge points or protruding surfaces shall be sufficiently protected to prevent damage to other parts within the same container. The above noted tolerances/thicknesses shall apply accordingly.

1.9 Steel Parts:

- 1.9.1 Small Steel parts shall be wrapped in protective paper or bubble wrap, and packaged in a container (Cardboard) box sufficient to supporting the contents, using suitable dividers. All products/parts shall be wrapped in such a way to prevent the tearing, chaffing and ripping of the paper/bubble wrap which would expose the bare metal/finished surfaces of the product/parts. Once properly protected, small parts may be placed in an appropriate sized cardboard tube.

1.10 Aluminum Parts:

- 1.10.1 Small aluminum product/parts shall be wrapped in protective paper or bubble-wrap, and separated in a container (Cardboard) box using suitable dividers.. All parts shall be wrapped in such a way as to prevent tearing, ripping and compression of the paper/bubble-wrap which would expose the bare metal/finished surfaces of the product/parts. Once properly protected, small parts may be placed in an appropriate sized cardboard tube.

1.11 Parts (Over 50LB):

- 1.11.1 Components (Ball Screws) over 50 lbs shall be shipped in a protective shipping tube and placed on a pallet, which prevents contact with any other protective tubes. Pallets shall be designed to prevent movement of protective tube(s). Tubes placed on a pallet shall be banded using steel or plastic banding to prevent movement during shipment.
- 1.11.2 Cylindrical assemblies shall be wrapped in protective Kraft paper/shipping paper, or suitable bubble-wrap to prevent inadvertent damage. Cylindrical components shall be place within a protective tube, with sufficient dunnage to prevent movement within protective tube. Tubes may be placed in a larger container with sufficient dunnage to prevent tube movement during shipping.

1.12 Copper Parts:

- 1.12.1 Small copper product/parts shall be packaged to protect finish/coating to prevent exposure of the bare metal/finish surface of the parts and contained in a container (Cardboard) box sufficient to supporting the contents, using suitable

dividers. All product/parts shall be wrapped in such a way to prevent tearing, and ripping of the paper/bubble wrap.

1.13 Threaded Parts:

- 1.13.1 External threaded portions of product/parts are to be protected with a plastic cover sufficient to cover and protect the external threads during handling and shipping of the parts.
- 1.13.2 Internal threaded parts are to be protected with a plastic plug; plugs should fit into I.D to prevent damage during handling and shipping of the parts and of a design that is fail proof where the plug cannot “fall-in” to the part accidentally..
- 1.13.3 Threaded parts shall be shipped in cardboard tubes within a larger cardboard outer box.

1.14 Part Partitions:

- 1.14.1 When required, partitions shall be used to provide adequate product/part protection against damage or scoring of parts and prevent/eliminate direct part to part contact.
- 1.14.2 Partitions shall provide both vertical and horizontal stability during transportation and storage as required.
- 1.14.3 A set of corrugated or solid fiberboard pieces slotted so that they interlock when assembled to form a number of cells into which parts may be placed for shipment
- 1.14.4 Partitions must not be less than full shoulder height of the containers and shall always exceed the product/part height in sufficient manner to protect the part under its own and other product/part weight. Horizontal dividers shall protect subsequent layers of product/parts from damage or collapse.
- 1.14.5 Partitions must be assembled in such a manner as to **prevent displacement of the partitions when the shipping container is inverted/tilted, laid sideways and or upside down.** The following are examples:
 - 1.14.5.1 At least 1 piece of corrugated or solid fiberboard to extend the full height of the shipping container; or
 - 1.14.5.2 An adhesive compound applied to 1 surface of the partition in such a way as to bond it to 1 of the inner surfaces of the shipping container. Dunnage shall be used in sufficient quantity to keep the parts from shifting out of the partitions.

2.0 Photographs of Acceptable Packaging;



Packaging for Tube



Packaging for Tube Assembled



Tubes Properly Boxed



Packaging for Piece Parts



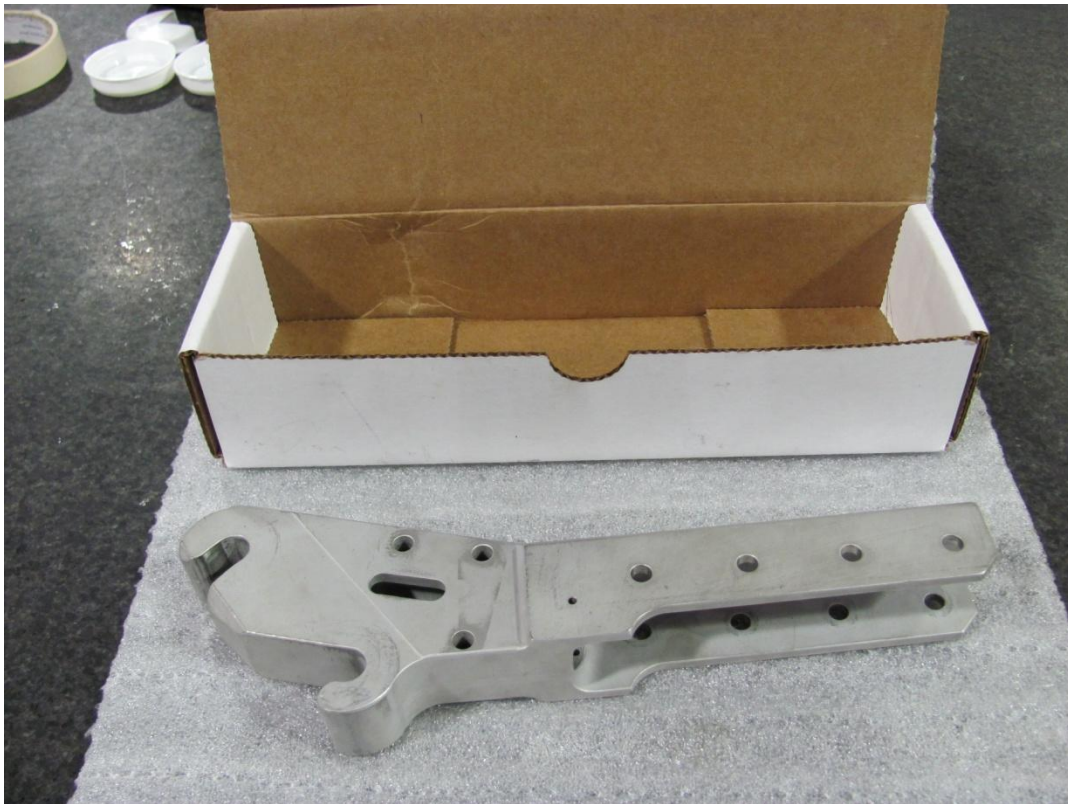
Cutaway View of Packaged Piece Parts



Packaging of Piece Parts Complete



Piece Parts Properly Boxed



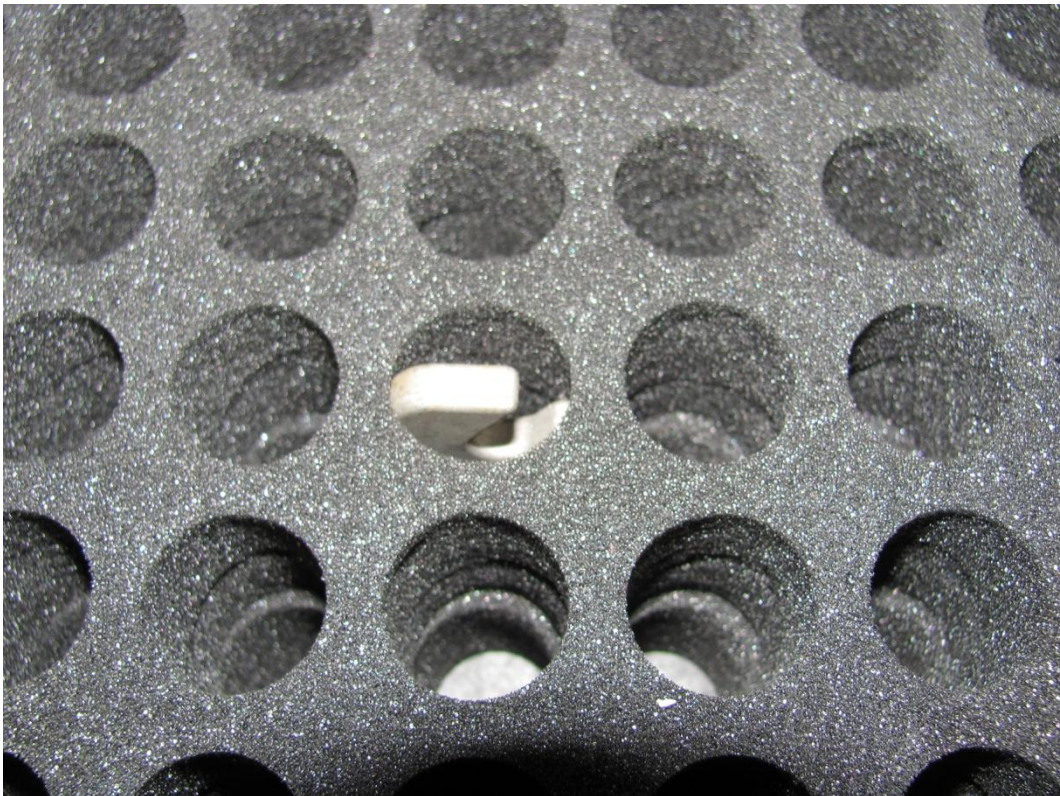
Odd Shape Parts Packaging Materials



Odd Shape Part Packaged



Odd Shape Part Packaging Complete



Foam may be used to ship parts in. Ensure that parts do not touch each other and that dunnage is placed securely over the top to keep parts from shifting during shipping.



Locking Head ready for packaging



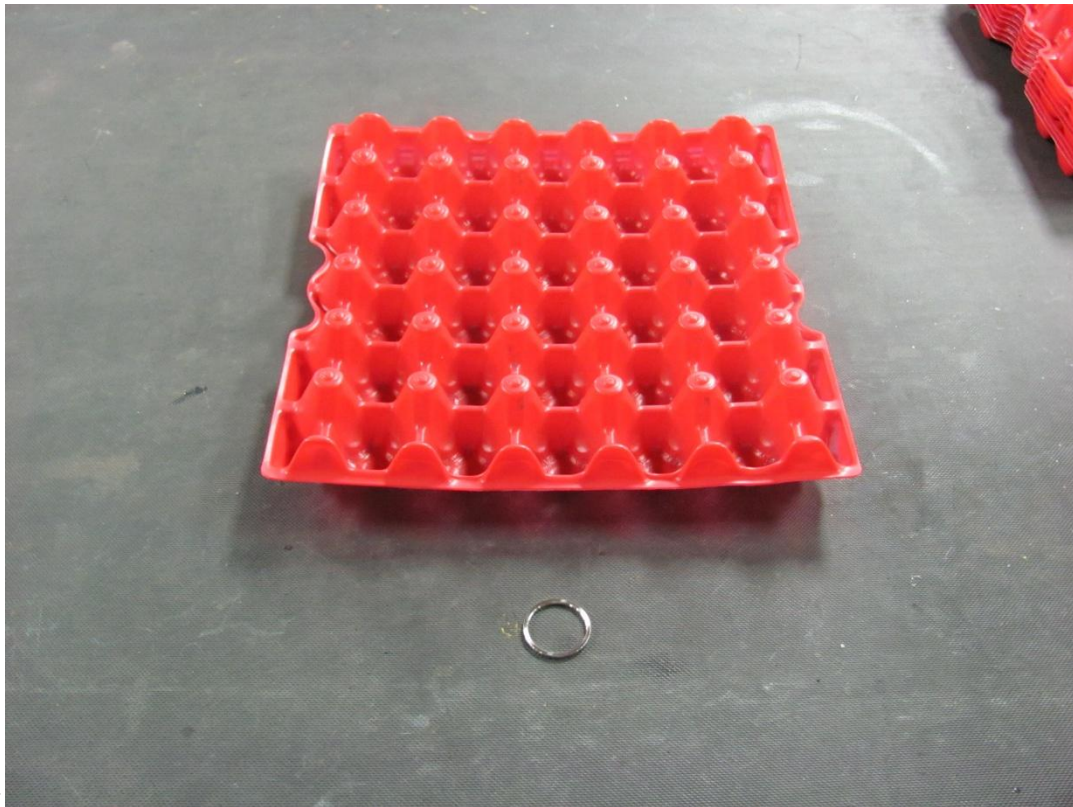
Locking Head wrapped



Locking head ready for packaging with tube and filler materials

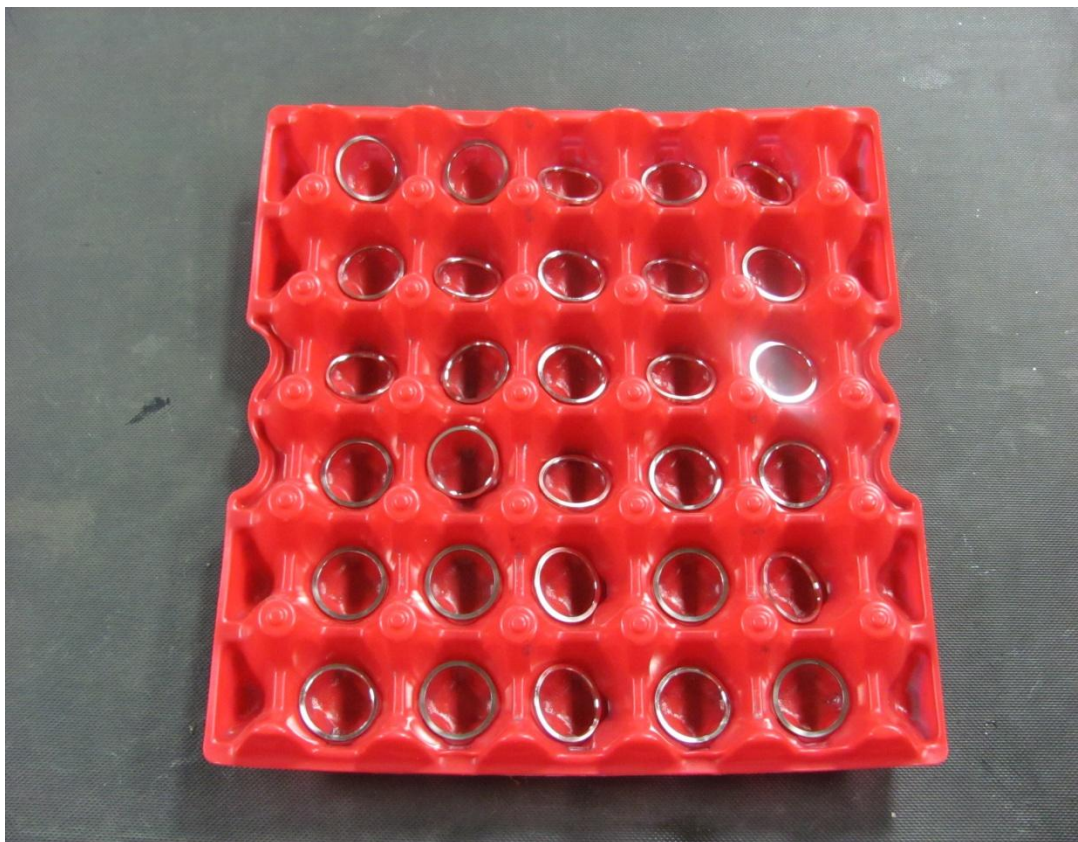


Locking head properly packaged

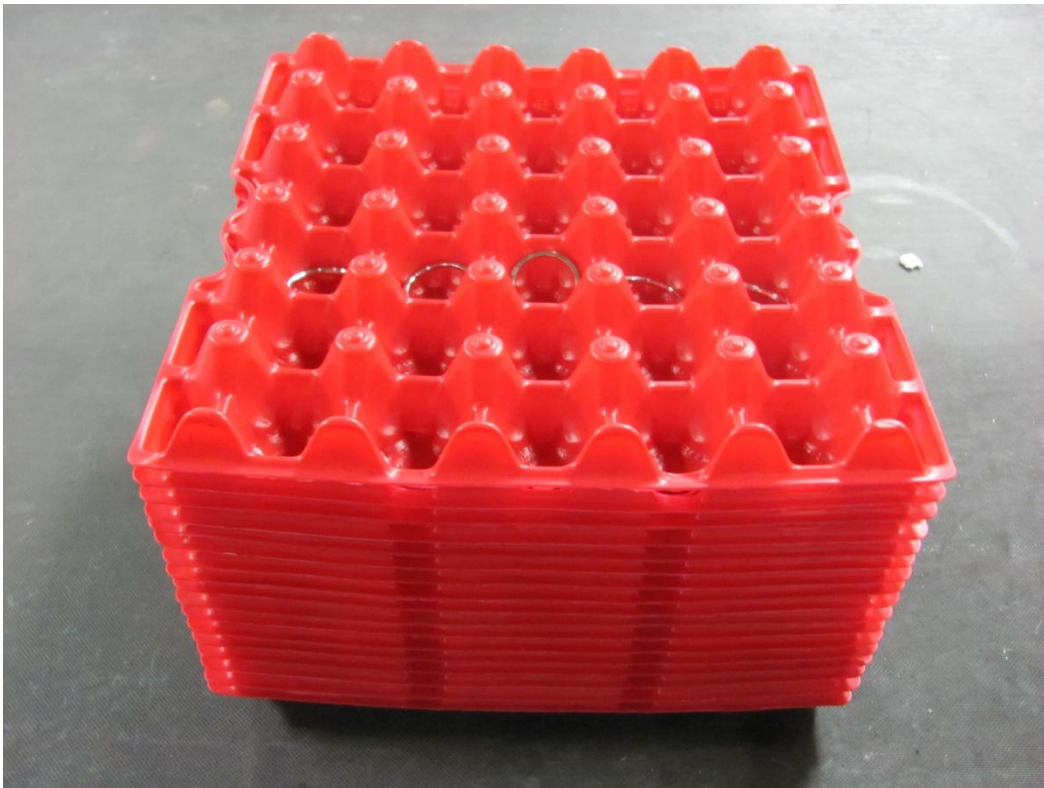


Locking

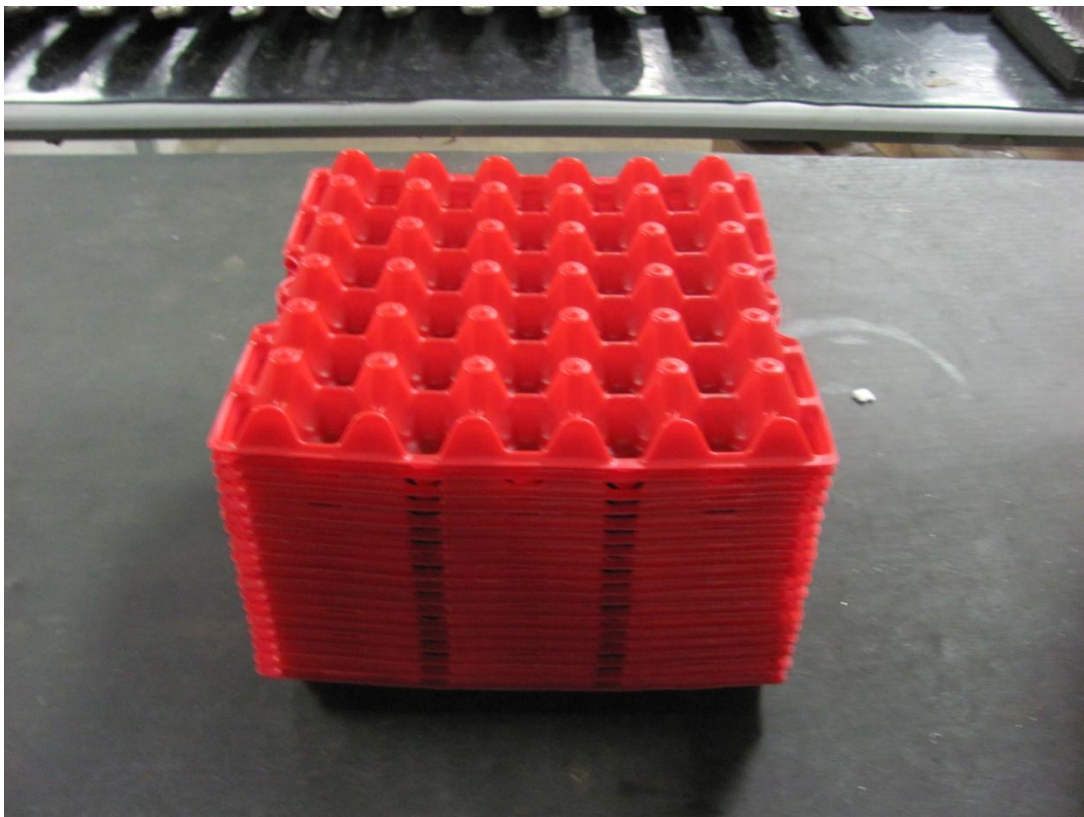
Proper use of egg crates



Parts placed into individual compartments



Individual egg crates stacked



Empty egg crate used to retain parts in lower egg crates



Egg crates properly wrapped to retain parts.

3.0 Photographs of Unacceptable Packaging;



Egg-crates-Unacceptable



Plastic Egg-crates-Unacceptable



Improper packaging resulting in dings and nicks in paint.



Over-pack Boxes without dividers resulting in damaged parts.



Inadequate tube protection and boxing



Inadequate, /no-horizontal dividers between foam resulting in damaged parts



An improperly packaged locking-head – nicks & dings.



Unacceptable egg crate packaging



Unacceptable Egg Crate Packaging