Designation: F2444 – 04 (Reapproved 2012)

Standard Practice for Damage Prevention of Bearings, and Bearing Components Through Proper Handling Techniques[1]

This standard is issued under the fixed designation F2444; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers requirements for the handling of all bearings and bearing components.

1.2 This is a general practice. The individual bearing handling requirements shall be as specified herein or as specified in the contract or purchase order. In the event of any conflict between requirements of this practice and the individual bearing requirements of an OEM drawing, procurement specification, or other specification, the latter shall govern. Many companies, organizations, and bearing users have excellent facilities, equipment, and knowledgeable personnel for handling bearings. The thrust of this practice is for users that do not have this knowledge of bearings.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ABMA Standard:*[2]

ABMA 1 Terminology

2.2 *ISO Standards:*[3]

ISO 14644-1 Cleanrooms and Associated Controlled Environments—Part 1: Classification of Air Cleanliness (DOD Adopted)

ISO 14644-2 Cleanrooms and Associated Controlled Environments—Part 2: Specifications for Testing and Monitoring to Prove Continued Compliance with ISO 14644-1

ISO 9001 Quality Management Systems—Requirements

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, refer to ABMA 1.

4. Significance and Use

4.1 This practice covers bearings and bearing components of all material compositions and grades. It may be used to develop a process for adequately handling bearings.

4.2 Unless the proper conditions of an adequate facility, equipment, and trained personnel are available, it may be better not to inspect the bearings in-house. The danger of contaminating and damaging the bearings may be much greater than the possibility of receiving bearings that will not function.

4.3 Bearings are easily damaged at the customers' receiving and test areas. In most cases, bearings should be accepted based on the bearing manufacturer's certification. Certificates of quality (conformance) supplied by the bearing manufacturer may be furnished in lieu of actual performance of such testing by the receiving activity of the bearings. The certificate shall include the name of the purchaser, contract number/PO number, name of the manufacturer or supplier, item identification, name of the material, lot number, lot size, sample size, date of testing, test method, individual test results, and the specification requirements.

4.4 This practice does not cover clean room requirements of miniature and instrument precision bearings. These bearings require clean room environments in accordance with ISO 14644-1 and ISO 14644-2.

5. Reasons for Not Handling Bearings

5.1 When bearings are received, the following questions must be asked:

5.1.1 What amount of inspection checks will be performed on the bearings? Do we need to do any checks?

5.1.2 What will it cost to establish and maintain equipment and facilities to inspect and test bearings?

5.1.3 What is the established history of the bearing? If there has never been a rejection, is inspection warranted?

5.1.4 What type of test is required and how detailed is it?

5.1.4.1 Rough spin,

5.1.4.2 Destructive,

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[1] This practice is under the jurisdiction of ASTM Committee F34 on Rolling Element Bearings and is the direct responsibility of Subcommittee F34.03 on Preservation, Cleaning and Packaging.

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[2] Available from American Bearing Manufacturers Association (ABMA), 2025 M Street, NW, Suite 800, Washington, DC 20036, http://www.americanbearings.org.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

5.1.4.3 Nondestructive (NDT),
5.1.4.4 Disassembly,
5.1.4.5 Test requires recleaning, relubrication, and repackaging of the bearings,
5.1.4.6 Test requires a clean room environment,
5.1.4.7 Dimensional, or
5.1.4.8 Performance.
5.1.5 What type of documentation is required?
5.1.6 Are trained personnel available?
5.1.7 Are adequate equipment and facilities available?
5.1.8 Do we have knowledge of the bearing manufacturer's quality system?

6. Equipment and Facilities

6.1 The list below provides some conditions that must be considered by the bearing user. The bearing user must determine if they have the necessary in-house capability to perform inspections and tests of bearings.

6.2 It is recommended that the bearing areas have a controlled environment.

6.3 The construction of the bearing handling areas should be made of materials that do not lend themselves to accumulating dust. It is recommended that plastic materials or other non-shedding materials be used for walls and ceilings. The floors should be of a material that will not require waxing, has very few seams if any, and a non-abrasive surface.

6.4 Bearing handling areas should be away from doors and windows to prevent dust from entering the area when the doors or windows are opened.

6.5 The room must be well-lit.

6.6 Containers with covers are recommended for use during inspection and tests of bearings. Racks, trays, and handling containers should be made of glass, solvent resistant plastic, or non-magnetic materials.

6.7 Tweezers and tongs should have blunt points and rounded edges, and be made of non-magnetic stainless steel. Other suitable materials may be used.

6.8 Compressed air, if any is used in the room for gauging, cleaning, or drying bearings, should be filtered and dehydrated.

6.9 Inspection equipment required would depend on what and how much inspection is to be performed. It could consist of microscopes for visual inspection, air gages for checking bores and outside diameters, electronic or mechanical gages for checking width, and special gages for checking radial play, torque, axial play, and preload. Not all of these gages are used on all bearings. Many of these tests can only be performed at the manufacturer's facility. Many dimensions can only be checked as component parts. These are made before the bearings are assembled.

7. Training of Bearing Personnel

7.1 All personnel handling bearings shall be trained and must demonstrate the ability to perform visual inspections of bearings. This training shall be documented on the employee training record.

7.2 The training may be divided into two parts. Classroom training may be Part I and performance training may be Part II.

7.3 Personnel must complete all of the training requirements.

7.4 The bearing supplier is responsible for performance of all of the testing and inspection requirements. The receiving activity may use assigned certified personnel and equipment or any other suitable facility with trained personnel in the performance of the acceptance tests or inspections.

8. General Handling Rules (Recommended Precautions)

8.1 Never touch bearings with the bare hands. Acid moisture deposited by fingers will corrode bearings, and particles of skin on the surface of the bearings are very hard to remove. Use tweezers, tongs, powder free rubber gloves, and finger cots.

8.2 A bearing should never be placed directly on a contaminated surface.

8.3 The use of headgear or hairnets is recommended to protect the bearings from hair contamination.

8.4 Personnel handling bearings should change their personal clothing when it becomes soiled or contaminated by solid or liquid materials.

8.5 Personnel should wear shoes or boots that are free of dirt or other contamination. Shoe brushes may be provided in these areas so that footgear can be cleaned.

8.6 Personal items such as jackets, sweaters, papers, food, or drinks should not be in areas of close proximity to the bearings.

8.7 Lint-free rags and cloths should be used when cleaning bearings

8.8 No smoking is allowed in any inspection, test, or assembly area where bearings are handled.

8.9 No paper should be allowed to touch bearings because of possible contamination from paper lint. Some paper is also acidic and could cause corrosion. The use of non-shedding paper is desirable for making notes and recording data. Plastic document protectors may be used to enclose paper documentation such as routing tickets, labels, etc.

8.10 No erasers or rubber bands should be permitted around bearings. These items are a source of particulate contamination.

8.11 Personnel should use ballpoint pens.

8.12 Personnel handling bearings should wash and dry hands frequently, especially after eating or smoking.

8.13 Do not carry tweezers or other working equipment in pockets. Pockets are a large source of contamination. Garments without pockets are desirable.

8.14 Clean all gages and working equipment before using.

8.15 Use only clean containers for holding bearings. Be careful not to use a container that may have held bearings with a different lubricant.

8.16 The use of abrasive paper around bearings is not recommended.

8.17 Table tops and workbenches should be cleaned with lint free cloths or sponges and appropriate cleaner.

8.18 Dust-proof cabinets may be used for storing bearings. No paper products should be allowed in the dust cabinets. Inkpads and stamps should not be placed in dust cabinets.

8.19 Fans should not be permitted in areas where bearings are handled.

8.20 Appropriate hand lotions containing moisturizers may be used in any of the bearing handling areas.

8.21 Areas should be kept neat and orderly. There should be covered trash containers available for disposal of waste products.

8.22 Bearings and components released by machines must be controlled to prevent damage.

8.23 If components or bearings drop on the floor, they must be inspected.

8.24 When emptying components into another container, prevent sharp hitting.

8.25 Components and bearings must be handled with care during measurements.

8.26 When removing components from tumblers, do not pour or drop components.

8.27 Place components gently into containers between machining operations.

8.28 Components segregated for regrind are to be handled just as acceptable items.

8.29 Do not shake, drop, or move containers abruptly.

8.30 Place components and bearings in baskets by layering with dividers.

8.31 During operations that may generate agitation, use caution to avoid part movement.

8.32 During placement and removal of containers from carts and wagons, handle gently.

8.33 Items subject to corrosion during fabrication or storage require special processing.

8.34 Preserve and package items in controlled areas as required.

8.35 Ensure that all bearings and components are properly identified at all times.

9. Preparation for Inspection

9.1 Bearings are easily damaged at the customer's receiving inspection or test area. The damage is usually caused by the lack of training on how to properly handle bearings.

9.2 Bearings should be brought into a suitable inspection area in the smallest unit container that has the complete marking and identification information.

9.3 Shipping and intermediate containers, if applicable, should be removed before the bearings are brought to the inspection area.

9.4 Do not open more vials or packages than are required to obtain the inspection sample.

9.5 Care should be taken so that plastic particles are not a source of contamination when vials must be cut open with razor blades, knives, or other sharp-edged instruments.

9.6 All bearing packages should be thoroughly cleaned on the outside to remove contamination. Cut plastic bags containing bearings with a razor blade or scissors.

9.7 When bearings are serialized, care must be taken to prevent any mix up. The same care needs to be taken on bearings that are coded or classified in any manner.

9.8 When separable bearings are being inspected, care should be taken not to interchange the inner and outer races, as they are usually matched. If the races become mixed, the bearings must be scrapped.

9.9 One of the first operations in preparing for inspection of bearings should be demagnetization. Magnetized bearings are highly susceptible to contamination. The manufacturer will demagnetize the bearings before shipping, but they will pick up magnetism en route. There are several types of demagnetizers available, but precautions should be taken in their proper use to insure the operator does not actually magnetize the bearings. The demagnification should be verified with a gaussmeter. A maximum of 5 gauss is recommended.

10. Sampling

10.1 Sampling for visual and dimensional testing of bearings and bearing components shall be done in accordance with the purchase order or contract. The unit of product for sampling purposes shall be one bearing as applicable. Acceptance number shall be zero for all sample series unless otherwise specified.

10.2 Remember that "each" handling operation detracts from the quality of the bearing. The benefits to be obtained from sampling are: less damage to the bearings caused by handling, reduction of inspection errors caused by fatigue and a reduced inspection time. Personnel performing the inspection and testing shall meet the specific training requirements of the organization.

11. Receiving Inspection

11.1 Handling of all bearing components and bearing assemblies requires care, patience, knowledge, and common sense.

11.2 Use clean, burr-free tools that are designed for the job. The tools should not be painted or metal-plated. Use nonmagnetic tools for miniature and instrument bearings.

11.3 Bearings should not be removed from the original packaging until they are ready for inspection, test, or use.

11.4 Protect unwrapped bearings by keeping them covered and dry at all times.

11.5 Miniature bearings, miniature precision bearings, and instrument bearings must be handled in a clean room environment.

11.6 Containers used for components and assemblies should be designed to avoid dents, nicks, and part-to-part impact. Size, type, and weight are important considerations when selecting containers for storage and movement of parts.

11.7 Assembled bearings shall be handled individually at receiving. Packaged bearings shall be removed from the packaging and placed in tote bins for inspection. Bearings shall be moved to other areas in the tote bins or may be individually placed in bags, vials, or racks. Bulk handling may be suitable for bearings 30 mm or less in diameter. All larger bearings shall be individually handled.

11.8 Inspect bearings using the unaided eye. Higher magnification is normally allowed to evaluate defects.

11.9 Plated, coated, and dry-film lubricated parts such as rings, retainers, and cages may require special handling. The manufacturer does not have these manufacturing processes in-house very often. Typically, the process supplier shall return the parts in the same containers that they received them in. Consideration must be given to the vibration the parts will receive from transport and handling. After inspection, the parts shall be returned to the appropriate packing to prevent unwanted part-to-part contact.

12. Dimensional Inspection and Performance Tests

12.1 Personnel performing the dimensional inspection and performance testing shall meet the training requirements of the organization.

12.2 The facility and environment conditions must be determined prior to performing measurements and other tests.

12.3 Segregate acceptable bearings from non-acceptable bearings and mark or tag accordingly.

12.4 All bearings and bearing components that are rejected must have disposition such as: return to vendor, rework, repair, scrap, or other.

12.5 Certain bearings have extremely thin radial ring sections that can be easily be deformed by testing gage loads. A maximum gage pressure must be established for all mechanical gage measurements. The user is strongly advised to obtain specific correlation with each bearing supplier when using a gage load.

12.6 Bearings should never be hammered or forced on test arbors or test fixtures. This can produce brinelling, race cracking, and damage to retainers.

12.7 All bearings being tested should be lubricated to prevent damage.

12.8 Extreme caution should be used any time a bearing has a load placed on it on a test fixture. Any loading of a bearing that is cocked on the fixture will tend to produce brinelling in the races.

12.9 Caution should be used any time a bearing is placed on or removed from the test fixture to prevent scratches in any critical areas.

12.10 If the proper conditions of facility, equipment and trained personnel are not available, it may be better to not inspect the bearings. The danger of contamination and damaging the bearings may be greater than the possibility of receiving defective bearings.

13. Disassembly

13.1 Properly trained personnel should be used for disassembly of bearings.

13.2 Use proper disassembly puller tools for removal of bearings from shafts and housings. Never use hammers, and avoid sharp blows to the bearings.

13.3 Make sure that bearing rings are removed evenly from shafts and housings to prevent cocking and distortion. This can damage the bearings or the assembly.

13.4 When removing bearings, clean the surrounding surfaces first. Isolate the used bearings and inspect them carefully before being reused or reprocessed. Make sure that bearings are free of heavy dirt and foreign contamination before placing them into containers.

13.5 Bearing containers will be provided in the disassembly area to keep bearings identified and segregated, and also to keep them from falling or hitting each other, causing additional damage.

13.6 Matched sets of bearings should be identified by tagging to keep bearings as a matched set.

13.7 Rolling elements such as balls, rollers, needles, and so forth shall be placed in plastic vials, plastic bags, cardboard boxes, or a similar container that will not cause damage because of part-to-part contact. The large rolling elements are extremely sensitive to bulk transfers and storage and must be suitably segregated from each other to prevent damage. Plastic mesh should be used if the components are layered.

14. Assembly

14.1 Properly trained personnel should be used for assembly of bearings.

14.2 Use proper assembly presses and heat in techniques to assemble bearings. Never use hammers, and avoid sharp blows to the bearings.

14.3 Make sure that bearing rings are started evenly on shafts or in housings to prevent cocking and distortion. This can damage the inspection equipment, bearings, and equipment.

14.4 Apply force only to the ring being press fitted. Never strike the outer ring to force the inner ring onto the shaft. Unusual force may cause brinelling that results in high torque, noisy operation, and shortened bearing life.

14.5 Assemble only clean parts that are free of burrs and raised metal.

14.6 When installing bearings, clean the surrounding surfaces first. Inspect the bearings carefully for damage before installing.

14.7 Bonded molded rubber seals shall be inspected before installation to insure that there is no binding and distortion of the rubber.

14.8 Bearings moved to the assembly area shall be placed in the original packaging or in plastic vials, plastic bags, or a similar container that will not cause damage.

15. Cleaning

15.1 Bearings must be cleaned by a controlled process. Bearings shall be demagnetized before cleaning to remove small steel particles that may adhere to the bearing surface.

15.2 Never use chlorinated solvents such as carbon tetrachloride or chloroform as cleaners.

15.3 Do not spin the assembled bearings during cleaning to avoid bearing damage. Also, caution should be taken in using ultrasonic cleaning to avoid bearing damage.

15.4 After cleaning, corrosion prevention shall be required for all corrosive-type materials because the protective oil has been removed.

15.5 The following rules are recommended:

15.5.1 Do not wash more bearings or bearing components than can be processed within 30 min.

15.5.2 Do not handle product with bare hands. Use tweezers, powder free latex gloves, or finger cots.

15.5.3 Dip the bearings and bearing components in protective lubricant at completion of inspection or test.

15.5.4 All parts reprocessed through wash must be relubricated or preserved within 30 min of wash.

15.5.5 Never leave parts dry for more than 30 min.

15.6 Stamped metal parts such as retainers, shields, seals, and wires that are susceptible to shape, flatness, roundness, or straightness problems should be cleaned by a process that will not cause damage to the components.

16. Lubrication

16.1 Lubrication of bearings is very critical. It would be preferred to purchase the bearings already lubricated to specification by the manufacturers who have the proper equipment and trained personnel.

16.2 Lubricants should be filtered. This must be done with caution to prevent removal of some of the important additives in the lubrication such as oil lubricants.

16.3 Use bearing quality lubricants. Keep the bearings clean during lubricating operations and covered between operations and after fully lubricated.

17. Packaging and Package Marking

17.1 The bearings shall be cleaned, dried, preserved and packaged in accordance with a controlled process. The level of preservation and packaging shall protect the bearings until the next process or operation.

17.2 The number of bearings or bearing components per unit container shall be in accordance with the customer requirement.

17.3 In addition to any special identification marking required by the customer, each unit pack, intermediate, and exterior container should be marked in accordance with the best commercial practice.

18. Bearing Storage

18.1 Bearings which are to be stored after inspection, waiting to be issued to production, must be stored in a suitable area.

18.2 It is recommended to issue the bearings with the oldest date first. This minimizes the possibility of corrosion and the aging of the lubricant while in storage.

18.3 Bearings that have long-term storage without being cleaned or relubricated should have a lubrication shelf life established to determine when the bearings will need to be cleaned and relubricated. In some cases, it may be advisable to return the bearings to the manufacturer for cleaning and relubrication.

18.4 Plated, coated and dry-film lubricated parts such as rings, retainers, and cages may require special storage. The size and weight of the parts is important to determine the appropriate container that will be used. The parts may be individually wrapped, placed in plastic mesh or sleeves, placed in plastic tubes, placed in plastic totes with compartments, packed in sealed poly bags, or layered with dividers and filler material to prevent damage.

19. Keywords

19.1 ball bearing; bearing rolling elements; plain bearing; roller bearing

APPENDIX

(Nonmandatory Information)

X1. HANDLING CHECKLIST

X1.1 This appendix is intended for guidance only. Checklists of this nature cannot be prepared that will cover all operations in all facilities in a comprehensive manner. Elements should be added or deleted from the checklist to reflect the actual control requirements in a given facility.

X1.2 The checklist is structured such that "YES" is the preferred answer; however, "YES" may not be appropriate in all areas. Judgment must be exercised to establish the specific requirements.

X1.3 To assist the user in quickly finding the specific topic of interest, the following subject index is provided:

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TABLE X1.1 Handling Checklist

MANAGEMENT		
1. Does the organization have a bearing and bearing components handling policy?	YES	NO
2. Is there a plan that encompasses specific areas and processes?	YES	NO
3. Does it assign responsibility for implementation?	YES	NO
4. Are formal audits provided for in the policy? (Formal) (Informal) (Other)	YES	NO
5. Is it part of the policy that bearings still be protected after they are inspected?	YES	NO
6. Is the document in agreement with ISO 9001 or other Quality System?	YES	NO
7. Does the policy provide for flow down to suppliers and subcontractors?	YES	NO
8. Are audits conducted at suppliers and subcontractors?	YES	NO
9. Are the auditors properly trained?	YES	NO
10. Is there a designated individual whose responsibility is to ensure procedures are followed?	YES	NO
11. Is there a committee to resolve any questions?	YES	NO
12. Does the committee have the support of senior management?	YES	NO
13. Is there a feedback plan that allows the committee to know when a problem is resolved?	YES	NO
14. Are provisions made to train personnel in handling requirements?	YES	NO
15. Are supervisors required to be trained?	YES	NO
16. Are personnel trained to identify the different types and degree of damage?	YES	NO
17. Is the use of food, drink, smoking, and personal items prohibited in the work areas?	YES	NO
18. Are there controls for temperature and contamination in handling areas?	YES	NO
19. Are there procedures that explain what to do if temperature and contamination is not maintained?	YES	NO
20. Are there provisions for recurring training for employees?	YES	NO
21. Who determines which employees will receive training? (Mgt) (Process Eng) (Supervisor) (Other)	YES	NO
22. Do custodial personnel need any training?	YES	NO
23. Are damaged items protected to prevent further damage to the part? Complicates analysis if not.	YES	NO
TRAINING		
1. Is there a training plan for handling of products?	YES	NO
2. Do all personnel receive training on handling of parts and assemblies?	YES	NO
3. Is the training course adequate?	YES	NO
4. How often is the course scheduled? Is this adequate?	YES	NO
5. Is someone responsible to determine when people should receive training?	YES	NO
6. Is there an oral or written examination given?	YES	NO
7. Are training records maintained and available for inspection?	YES	NO
8. Is training provided for the people who perform the following functions?		
a. Supervise and manage personnel	YES	NO
b. Purchasing	YES	NO
c. Design and process engineering	YES	NO
d. Receiving Inspection	YES	NO
e. Manufacturing work areas	YES	NO
f. Inspection and test	YES	NO
g. Assembly	YES	NO
h. Rework of assemblies and components	YES	NO
i. Removal and installation of bearings	YES	NO
j. Field service personnel	YES	NO
k. Maintenance personnel	YES	NO
l. Cleaning, lubrication, packaging and storage	YES	NO
m. Other	YES	NO
9. Is someone responsible for the handling training course?	YES	NO
10. Are people who satisfactorily complete this training documented by some records?	YES	NO
11. When people make related mistakes is there a requirement for refresher training?	YES	NO
12. Is training designed for the different needs of different areas and personnel skills?	YES	NO
13. Does the training explain what to do with parts that are improperly handled?	YES	NO
14. Does the training explain procedures in event parts are suspected of being damaged?	YES	NO
15. Does the training explain use of handling tools and techniques to prevent damage?	YES	NO
16. Does the training explain what to do or who to see if the procedure is in error or incomplete?	YES	NO
17. Are custodial personnel getting any training?	YES	NO
ENGINEERING		
1. Are all engineering personnel trained in handling awareness?	YES	NO
2. Have all components in the bearing design been selected for analysis to prevent damage?	YES	NO
3. Was the analysis performed to verify adequacy of the preventive handling measures?	YES	NO
4. Do drawings provide precautionary procedures and identify sensitive finishes and dimensions?	YES	NO
5. Have tests been conducted to prove the effectiveness of handling measures?	YES	NO
6. Do engineers assist in failure analysis and implementing corrective action?	YES	NO
7. Are engineering procedures reviewed to see that they are (current) (adequate) (in-use)?	YES	NO
8. Does engineering review the adequacy of personnel training and damage prevention measures?	YES	NO
9. Have all of the technical requirements for handling been identified?	YES	NO
PROCUREMENT		
1. Are handling damage prevention requirements defined by a procedure, instruction or other?	YES	NO
2. Have personnel who procure items and services been trained in handling awareness?	YES	NO
3. Do handling requirements exist for inclusion in procurement documentation?	YES	NO
4. Are pre-award and in-process audits performed on subcontractors on handling procedures?	YES	NO
5. Are there lists of suitable and unsuitable subcontractors and suppliers?	YES	NO
6. Are handling requirements incorporated in procurement documents?	YES	NO
7. Are subcontractors and suppliers required to certify that items are handled using controls?	YES	NO

8. Do suppliers and subcontractors have corrective action programs?	YES	NO
9. Is purchasing included on distribution of deficiency reports concerning damaged items?	YES	NO
10. Are audits performed to insure procedures are (current), (adequate), and (in-use)?	YES	NO
RECEIVING		
1. Are handling damage prevention requirements defined by a procedure, instruction, or other?	YES	NO
2. Are receiving personnel able to identify items sensitive to handling damage?	YES	NO
3. Are all intermediate and in process shipping containers inspected for damage?	YES	NO
4. Are there procedures to explain:		
a. How to handle items that are improperly packaged?	YES	NO
b. How to handle items that are improperly labeled?	YES	NO
c. What to do with items being worked on at the end of a shift and at breaks?	YES	NO
5. Are parts properly packaged inside a protective container?	YES	NO
6. Are items checked to see that they were properly protected during shipments?	YES	NO
7. When parts are removed from protective containers, is it done in a suitable work area?	YES	NO
8. After items are inspected, are they repackaged in protective material prior to leaving area?	YES	NO
9. Does the work area have special requirements?		
a. Apparel: aprons, gloves, finger cots, shoe covers, hoods, masks, coveralls, other?	YES	NO
b. Cleaning: cleaning systems, drying systems, abrasives, air guns, equipment, other?	YES	NO
c. Supplies: swabs, moisturizers, plastic bags, cleaning solutions, packaging, tags, other?	YES	NO
d. Equipment: cabinets, dispensers, tools, microscopes, heaters, ovens, pumps, other?	YES	NO
e. Monitoring Equipment: analyzers, sensors, pressure gages, cleanliness measurement?	YES	NO
f. Furniture: non-shedding benches, cabinets, floors, lockers, racks, stools, chairs, other?	YES	NO
10. Are drinking, eating, smoking, and personal products prohibited in the work areas?	YES	NO
11. Are audits performed to insure procedures are (current), (adequate), and (in-use)?	YES	NO
12. Have damage-handling controls been properly implemented?	YES	NO
STORAGE AREA		
1. Are handling damage prevention requirements defined by a procedure, instruction or other?	YES	NO
2. Are all items received with adequate protection?	YES	NO
3. Are there procedures to explain?		
a. How to handle items that are improperly packaged?	YES	NO
b. How to handle items that are improperly labeled?	YES	NO
c. What to do with items being worked on at the end of a shift and at breaks?	YES	NO
4. Are items marked so they are readily recognized to prevent the need to open the protective pack?	YES	NO
5. Is a record maintained of any discrepancy found and corrective action taken?	YES	NO
6. Is the work area adequate? (See Receiving par 9 above for special requirements)	YES	NO
7. Are drinking, eating, smoking, and personal products prohibited in the work areas?	YES	NO
8. Are items maintained in protective covering when they are handled and moved?	YES	NO
9. Are partial issues maintained in protective covering?	YES	NO
10. Are items kitted in a suitable area?	YES	NO
11. Are audits performed to insure procedures are (current), (adequate), and (in-use)?	YES	NO
12. Have damage-handling controls been properly implemented?	YES	NO
WORK AREAS		
1. Are handling damage prevention requirements defined by a procedure, instruction, or other?	YES	NO
2. Are all items received with adequate protection?	YES	NO
3. Are there procedures to explain?		
a. How to handle items that are improperly packaged?	YES	NO
b. How to handle items that are improperly labeled?	YES	NO
c. What to do with items being worked on at the end of a shift and at breaks?	YES	NO
4. Are drinking, eating, smoking, and personal products prohibited in the work areas?	YES	NO
5. Does the work area have special requirements?		
a. Apparel: aprons, gloves, finger cots, shoe covers, hoods, masks, coveralls, other?	YES	NO
b. Cleaning: cleaning systems, drying systems, abrasives, air guns, equipment, other?	YES	NO
c. Supplies: swabs, moisturizers, plastic bags, cleaning solutions, packaging, tags, other?	YES	NO
d. Equipment: cabinets, dispensers, tools, microscopes, heaters, ovens, pumps, other?	YES	NO
e. Monitoring Equipment: analyzers, sensors, pressure gages, cleanliness measurement?	YES	NO
f. Furniture: non-shedding benches, cabinets, floors, lockers, racks, stools, chairs, other?	YES	NO
6. Are proper handling tools required and properly used?	YES	NO
7. Has everyone in the work area been trained in handling precautions?	YES	NO
8. Are untrained personnel restricted from entering some work areas?	YES	NO
9. Is a record maintained of any discrepancy found and corrective action taken?	YES	NO
10. Are items received in this area properly protected?	YES	NO
11. Are items maintained in protective covering except when being handled?	YES	NO
12. Are items protected throughout the entire workstation process?	YES	NO
13. Is there the same protection for failed items?	YES	NO
14. Are audits performed to insure procedures are current, adequate, and in-use?	YES	NO
15. Have damage-handling controls been properly implemented?	YES	NO
SHIPPING AREA		
1. Are handling damage prevention requirements defined by a procedure, instruction, or other?	YES	NO
2. Are all items received with adequate protection?	YES	NO
3. Are there procedures to explain?		
a. How to handle items that are improperly protected?	YES	NO
b. How to handle items that are improperly labeled?	YES	NO
c. What to do with items being worked on at the end of a shift and at breaks?	YES	NO

4. Are drinking, eating, smoking, and personal products prohibited in the shipping areas?	YES	NO
5. Are items maintained in protective covering at all time?	YES	NO
6. Does the packaging provide protection from vibration, brinelling, dropping, or contamination?	YES	NO
7. Are the handling workstations adequate in the shipping area?	YES	NO
8. Are special tools, equipment and materials required and available?	YES	NO
9. Is the lighting, air quality, and facilities adequate in the shipping area?	YES	NO
10. Is action is taken when the work area is deemed unsuitable?	YES	NO
11. Are audits performed to insure procedures are (current), (adequate), and (in-use)?	YES	NO
12. Have damage-handling controls been properly implemented?	YES	NO
13. Is a record maintained of any discrepancy found and corrective action taken?	YES	NO
IN PLANT AND INTER-PLANT MOVEMENT		
1. Is there a document that explains how items will be handled while being moved from area to area?	YES	NO
2. Does the document explain the difference in “inter” and “intra” plant movement?	YES	NO
3. Does the document explain how the items will be protected and labeled to prevent damage?	YES	NO
4. Are there procedures to explain?		
a. How to handle items that are improperly protected?	YES	NO
b. How to handle items that are improperly labeled?	YES	NO
c. What to do with items being worked on at the end of a shift and at breaks?	YES	NO
5. Are all items protected during transportation in the plant and outside the plant?	YES	NO
6. Is someone responsible to check the protective covering prior to movement?	YES	NO
7. Are audits performed to insure procedures are current, adequate, and in-use?	YES	NO
8. Have damage-handling controls been properly implemented?	YES	NO
9. Is a record maintained of any discrepancy found and corrective action taken?	YES	NO
10. Are subcontractors and suppliers properly trained in the movement of items to prevent damage?	YES	NO
INSPECTION STATIONS		
1. Are handling damage prevention requirements defined by a written procedure?	YES	NO
2. Are all items received at the inspection area with adequate protection?	YES	NO
3. Are there procedures to explain?		
a. How to handle items that are improperly packaged?	YES	NO
b. How to handle items that are improperly labeled?	YES	NO
c. What to do with items being worked on at the end of a shift and at breaks?	YES	NO
4. Are drinking, eating, smoking and personal products prohibited in the inspection areas?	YES	NO
5. Does the inspection area have special requirements?		
a. Apparel: aprons, gloves, finger cots, shoe covers, hoods, masks, coveralls, other?	YES	NO
b. Cleaning: cleaning systems, drying systems, abrasives, air guns, equipment, other?	YES	NO
c. Supplies: swabs, moisturizers, plastic bags, cleaning solutions, packaging, tags, other?	YES	NO
d. Equipment: cabinets, dispensers, tools, microscopes, heaters, ovens, pumps, other?	YES	NO
e. Monitoring Equipment: analyzers, sensors, pressure gages, cleanliness measurement?	YES	NO
f. Furniture: non-shedding benches, cabinets, floors, lockers, racks, stools, chairs, other?	YES	NO
6. Are proper handling tools required and properly used?	YES	NO
7. Has everyone in the inspection area been trained in handling precautions?	YES	NO
8. Are untrained personnel restricted from entering some inspection areas?	YES	NO
9. Is a record maintained of any discrepancy found and corrective action taken?	YES	NO
10. Are items received in this area properly protected?	YES	NO
11. Are items maintained in protective covering except when being handled?	YES	NO
12. Are items protected throughout the entire inspection station process?	YES	NO
13. Is there the same protection for failed items?	YES	NO
14. Are audits performed to insure procedures are current, adequate, and in-use?	YES	NO
15. Have damage-handling controls been properly implemented?	YES	NO
QUALITY FUNCTION		
1. Are handling damage prevention requirements defined by quality procedure, instruction or other?	YES	NO
2. Are all quality control personnel able to identify items sensitive to handling damage?	YES	NO
3. Are there quality procedures to explain:		
a. How to handle items that are improperly packaged?	YES	NO
b. How to handle items that are improperly labeled?	YES	NO
c. What to do with items being worked on at the end of a shift and at breaks?	YES	NO
4. Do quality control personnel inspect handling operations in the work areas?	YES	NO
5. Do quality control personnel determine that customer requirements are being met?	YES	NO
6. Do quality personnel participate in pre-award and post-award surveys at the:		
a. Contractors?	YES	NO
b. Subcontractors?	YES	NO
c. Suppliers?	YES	NO
8. Do quality personnel perform handling audits at the:		
a. Contractors?	YES	NO
b. Subcontractors?	YES	NO
c. Suppliers?	YES	NO
9. Are audits performed to insure procedures are current, adequate, and in-use?	YES	NO
10. Are drinking, eating, smoking, and personal products prohibited in the inspection areas?	YES	NO
11. Have damage-handling controls been properly implemented?	YES	NO
12. Does quality control ensure all handling failures are documented?	YES	NO
13. Does quality control maintain a data bank of the causes, trends, and corrective action for all handling failures?	YES	NO
14. Does the inspection area have special requirements?		
a. Apparel: aprons, gloves, finger cots, shoe covers, hoods, masks, coveralls, other?	YES	NO
b. Cleaning: cleaning systems, drying systems, abrasives, air guns, equipment, other?	YES	NO

c. Supplies: swabs, moisturizers, plastic bags, cleaning solutions, packaging, tags, other?	YES	NO
d. Equipment: cabinets, dispensers, tools, microscopes, heaters, ovens, pumps, other?	YES	NO
e. Monitoring Equipment: analyzers, sensors, pressure gages, cleanliness measurement?	YES	NO
f. Furniture: non-shedding benches, cabinets, floors, lockers, racks, stools, chairs, other?	YES	NO