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AEROSPACE RECOMMENDED PRACTICE

ARP 1554

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Revised

AUTO TRANSPORT UNIT LOAD DEVICES

1. PURPOSE: This Aerospace Recommended Practice (ARP) provides functional, dimensional, structural and environmental requirements for auto transport devices used to transport automobiles in wide bodied aircraft. These devices are intended to be used in conjunction with pallets compatible with NAS 3610 Class II restraint system or pallets matching the width of autos to ensure maximum use of aircraft volume. The ULD shall facilitate alteration for carriage of general cargo during return haul. Pallet nets used in conjunction with existing pallets in order to restrain general cargo are also described in NAS 3610. The minimum essential criteria are identified by use of the word "shall". Recommended criteria are identified by use of the key word "should", and while not mandatory, are considered to be of primary importance in providing dependable, economical and practical auto transport devices. Deviation from recommended criteria should occur only after careful consideration, extensive testing and thorough service evaluations have shown alternate methods to be satisfactory.

   It is the intent of this ARP to specify minimum air and ground handling features and to ensure interchange capability and compatibility with present and future air transport and ground handling systems. It is not the intent of this ARP to specify equipment designs.

   The unit load devices specified herein shall be designed primarily for the transport of automobiles and alternately for the transport of general air cargo in an acceptable and profitable manner.

2. SCOPE:

2.1 This document establishes three types of transport units for carriage of autos: types A (lower deck) and type B (main deck) will be used for carriage of one automobile in conjunction with an air cargo pallet compatible with NAS 3610 Class II restraint systems, primarily in a random intermix with general cargo pallets. Type C (main deck) will be used, in order to maximize cubage utilization, for carriage of two or more automobiles as a full or part charter operation.

2.1.1 Type A: Will be used for carriage of one automobile on the lower deck of both freighter and/or passenger wide bodied aircraft, in conjunction with either a 60.4 x 125 inches (1534 x 3175 mm) or a 88 x 125 inches (2235 x 3175 mm) air cargo pallet compatible with NAS 3610 Class II restraint systems.

2.1.2 Type B: Will be used for carriage of one automobile in a slanted configuration on the main deck of freighter wide bodied aircraft, in conjunction with a 88 x 125 inches (2235 x 3175 mm) or 96 x 125 inches (2438 x 3175 mm) air cargo pallet compatible with NAS 3610 Class II restraint systems.

2.1.3 Type C: Will be used for carriage of two or four automobiles in a double level configuration on the main deck of freighter wide bodied aircraft, in conjunction with:

- either (an) air cargo pallet(s) compatible with NAS 3610 Class II restraint systems,

- or (a) specially designed air cargo pallet(s) matching the width of autos in order to ensure maximum use of aircraft volume.

2.2 Design Objectives:

2.2.1 Accommodate as many auto types and sizes as feasible within the aircraft envelope, with emphasis on those most frequently shipped.

2.2.2 Ensure profitable return haul usage with general air cargo.

2.2.3 Ensure accessibility and compatibility to meet minimum restricted article requirements for preparation of autos for shipment.

2.2.4 Protection of autos from damage.

2.2.5 Maintainability using standard high quality aerospace practices.

3. APPLICABLE DOCUMENTS:

3.1 The following specifications, standards, or applicable portions thereof should be considered.

3.1.1 NAS 3610 - Minimum Requirements and Test Conditions for Cargo Unit Load Devices and Equipment to be Installed in Certified Aircraft.

3.1.2 ARP 1395 - Minimum Requirements for Future Wide-Body Aircraft Cargo Systems and Compartments (Intermodal).

3.1.3 ARP 1372A - Minimum Requirements for Air Cargo Unit Load Devices Ground Handling and Transporting Systems.

3.1.4 ARP 1334A - Ground Equipment Requirements for Compatibility with Aircraft Unit Load Devices (IATA AHM 911 is equivalent).

3.1.5 AS 832C - Air Land Demountable Cargo Container.

3.1.6 AS 1130B - Air Land Demountable Cargo Pallet.

3.2 Other Applicable Documents:

3.2.1 IATA 50/0 - General Technical Requirements and Serviceability Limits.

3.2.2 IATA 50/1 - Pallet for NAS 3610 Class II Restraint System.

3.2.3 IATA 50/6 - Air-Surface Intermodal Container (equivalent to AS 832C).

3.2.4 IATA 50/9 - ISO Size Cargo Pallets (equivalent to AS 1130B).

3.2.5 United States Department of Transportation Motor Carriers Safety Regulations Part 393.100, Subpart I, "Protection Against Falling or Shifting Cargo".

3.3 Dangerous Goods Regulations: It is not the intent of this ARP to provide criteria applicable to the safe air transport of automobiles as far as hazardous materials/restricted articles regulations are concerned. Details of applicable regulations can be found in:

3.3.1 United States Department of Transportation Materials Transportation Bureau Regulations, Parts 173.120, 173.250, 173.257, 173.306, 175.305 and 176.905.

3.3.2 IATA Dangerous Goods Regulations, Packing Notes 900 and 901.

4. REQUIREMENTS:

4.1 Dimensions:

4.1.1 Type A: Shall adapt to a pallet length of 125 inches (3175 mm) and should have an adjustable width range of 58 inches (1473 mm) to 88 inches (2235 mm).

4.1.2 Type B: Shall adapt to a pallet length of 125 inches (3175 mm) and should have an adjustable width of 88 inches (2235 mm) or 96 inches (2438 mm).

4.1.3 Type C: Shall adapt to a pallet length of 196 inches (4978 mm) and should have an adjustable width range with, at least, 62.5 inches (1588 mm), 88 inches (2235 mm) and 96 inches (2438 mm) fixed positions.

4.2 Construction:

4.2.1 Units shall be rugged, weatherproof and lightweight.

4.2.2 Components shall not permit liquids, sand or debris to accumulate within.

4.2.3 Unit construction shall provide sufficient structural strength to withstand, without permanent deformation, the static and dynamic loads and the impact shock and racking stresses resulting from over-the-road carriage at highway speeds, forklift handling and (if applicable) top lifting while loaded to maximum capacity, and anticipated in flight loads associated with the appropriate NAS 3610 Class II restraint.

4.3 Base:

4.3.1 The unit design shall ensure that, when fully loaded, the unit base foot imprint area loading on the pallet does not exceed 400 lbs per sq. foot (1.9 kPa).

4.3.2 The unit shall be equipped with a flat and continuous drip pan that would also form a base. The bottom surface of the drip pan shall not point load or have sharp edges in contact with the pallet. Clean out openings should be provided, sized so that waste material may be flushed out of the pan.

4.3.3 No structure, fittings or other objects shall protrude below the bottom surface of the base.

4.3.4 The unit base shall structurally adapt to any pallet equipped with continuous seat track along the edgerail and having the designed nominal length appropriate to the unit type.

4.3.5 Attachment of the unit base to the pallet shall be accomplished using universal seat track fitting complying with MS 33601A standard, and which can be installed or removed without modification or the use of tools. Attach fittings shall meet or exceed minimum NAS 3610 - Class II restraint requirements.

4.3.6 The number of attach fittings shall be kept to a minimum. There shall be no less than one attach fitting per corner area of the pallet.

4.3.7 Attach fittings shall be designed so as to provide a means to prevent all vertical and horizontal movements beyond ±.125 inch (3,2 mm) which may occur between the unit and pallet.

4.3.8 When attached to a pallet, the unit base design shall provide for support and ease of movement at the not to be exceeded distributed load specified in 4.3.1 and 11.3.1 of this document and on a minimum conveyor system as outlined in ARP 1334A.

4.3.9 Base design shall take into account in-plane conveyor power drive systems and their inability to move a ULD when the pallet flexes away from the conveyor friction drive devices.

4.4 Auto Support:

4.4.1 The auto shall be supported by its tires. Wheel trays shall provide full support for each tire imprint area.

4.4.2 Overall dimensions of wheel support trays shall be kept to a minimum. Automobiles and/or supporting structure which overhang the pallet will be acceptable if it can be demonstrated that no damage to the aircraft and/or shipment will occur if normal pallet handling practices are employed.

4.4.3 Auto support structures which cannot be disassembled, fully collapsed and bundled for return haul, shall collapse within the overall dimensions of the pallet the fixture rests on. When collapsed, the base shall facilitate cargo loading, pallet edgerail shall be fully accessible for net attachment and aircraft restraint.

4.4.4 Auto support wheel trays shall permit placement/rolling of the auto on the wheel tray without the use of the forklifts and/or other lifting devices which may damage the auto. It is recognized that accessory loading ramps may be a part of this device.

4.4.5 Each wheel tray shall be equipped with fork tineways suitable for moving and/or assembling the fixture with a maximum allowable weight auto on board. Tineways shall be fully enclosed or equivalent, so as to ensure against damage to the auto and provide tipping restraint. Type C units shall be forkable from either upper or lower level when loaded to maximum weight capacity on both levels.

4.4.6 Tineway dimensions shall be per Figure 1.

4.4.7 Type C units should preferably be also equipped with ISO type top lifting fittings suitable for moving the fixture with the maximum allowable weight on board. Fittings shall be located 120.75 inches (3067 mm) apart on center longitudinally. Fitting loads should take into account that as much as 60% of the load may be at one end of the fixture. A minimum alternate to the ISO fittings would be to fit apertures in the post structures that allow for a 1 inch (25,4 mm) diameter clevis bolt attachment. See Figure 3 for locations of top lifting fittings in relation to the unit overall dimensions.

4.4.8 Each wheel tray shall be equipped with a minimum of two (2) wheel chocks and/or equivalent to control forward and reverse wheel movement. Chock locking positions shall permit placement of auto on center of unit regardless of wheel base designs or axle locations.

4.4.9 In order to accommodate the maximum possible range of auto wheel bases and at the same time keep the length of the wheel tray to a minimum, wheel chocks shall be located on inboard side of the wheels.

4.4.10 If continuous wheel channels are used to support the auto, channel end stops shall be provided to prevent the auto from rolling off one far end during loading.

4.4.11 Wheel tray loading ramps shall permit manual loading on the ground before loading the pallets into the aircraft.

4.4.12 Wheel curb rails and/or restraints shall be provided to control lateral movement of the auto.

4.5 Type A Unit - Lower Deck:

4.5.1 Type A units shall include compatibility with small cargo door aircraft and be adaptable to a 60.4 x 125 inch (1534 x 3175 mm) pallet to facilitate transportation of sub-compact autos occupying only 2 LD-3 positions in lower deck or an 88 x 125 inch (2235 x 3175 mm) pallet to facilitate carriage of wider autos on aircraft with full size pallet cargo doors.

4.5.2 Wheel support tray shall provide simple means of adjusting the height of an automobile and supporting it at maximum allowable weight while in transit. The range of height adjustment shall be from 4 inches (102 mm) to 12 inches (305 mm) as measured from the conveyor roll plane.

4.5.3 To permit the carriage of autos wider than 60.4 inches (1534 mm) but less than 70 inches (1778 mm) in the lower deck of aircraft, and occupying only two LD-3 positions of the aircraft, the wheel support tray shall be designed so as to extend over the edgerail of the pallet on one (1) side only. The range of adjustment of the wheel tray shall extend from the 60.4 inch (1534 mm) pallet edgerail dimension to 67.5 inches (1715 mm). The auto and carrier shall be no closer than 1 inch (25 mm) inboard of the pallet edgerail on the other side.

4.5.4 The overall length of the wheel tray for lower deck application should not exceed 125 inches (3175 mm).

4.5.5 Either longitudinal side of the unit shall function facing forward or aft in the aircraft and shall not interfere with other ULD's or auto transport units in adjoining aircraft positions. This requirement shall apply on one side only when autos exceeding pallet width are carried as per Para. 4.5.3 above.

4.5.6 Where applicable, design objective for spacing between cars in adjoining positions shall be 2 inches (51 mm).

4.6 Type B Unit - Main Deck - Slanted Type:

4.6.1 Type B units shall adapt to an 88 x 125 inches (2235 x 3175 mm) or 96 x 125 inches (2438 x 3175 mm) pallet. The overall height of the units in the lowered (horizontal) or erected (fully slanted) position shall be less than 96 inches (2438 mm) measured over the conveyor plane, not including the height of the car.

4.6.2 Wheel support trays shall include simple mechanical or hydraulic means to be raised into a slanted position up to a 40° angle from the horizontal position.

4.6.3 The operation of the raising device shall be possible within or out of the aircraft, by one man without external power source, using a crank, lever or hand tool with a manual effort not exceeding 70 lbs (31 daN) at maximum car weight capacity.

4.6.4 It is recognized that longer types of automobiles, when installed on the unit in the slanted position, will exceed the 125 inches (3175 mm) pallet length and require limited contours on the adjoining pallet positions, if loaded with general cargo. However, design shall provide capability of end to end location of the base pallets, regardless of auto length, whenever two or more type B units are adjacent to each other.

4.6.5 The overall length of the wheels trays should not exceed 125 inches (3175 mm) in order to facilitate return haul usage. It is recognized that, in the operative horizontal posistion, part of the raising end of the wheel trays will overhang from the pallet.

4.6.6 Either small side of the unit shall function facing forward or aft in the aircraft and shall not interfere with restraint of other ULDs or auto transport units in adjoining aircraft positions.

4.6.7 The raising end of each wheel tray shall be equipped with stops, adjustable by 2 inches (51 mm) increments, in order to limit the position of the automobile, once raised, to either 96 inches (2438 mm) or 118 inches (2997 mm) height clearance.

4.6.8 Wheel chocks taking a minimum of 80° angle of the wheels shall be provided in order to ensure protection against car movement in the maximum slanted position.

4.6.9 Where applicable, design objective for spacing between cars in adjoining positions, or a car and a structural member, shall be a minimum of 2 inches (51 mm).

4.7 Type C Unit - Main Deck - Two Level Type:

4.7.1 Type C units shall adapt to any pallet or combination of pallets having an overall length of 196 inches (4978 mm) and having an overall width range between 62.5 inches (1588 mm) and 125 inches (2438 mm).

4.7.2 The upper level of this device shall be designed to maximize the use of the aircraft internal cross-section available so as to accommodate the maximum height, length and width auto(s) possible.

4.7.3 The lower level of this device shall permit flow through capability of the lower auto(s) and allow the frame of the auto(s) to extend over the pallet edgerails in both longitudinal directions during transit. To permit carriage of autos greater than 196 inches in length, it is recognized that autos may extend into aircraft walkways.

4.7.4 The second level auto tray shall provide lightweight liquid spill/drip protection to protect the lower auto. The protective shield used shall be able to withstand and be compatible with all types of liquids, lubricants and/or acids normally used on automobiles.

4.7.5 Horizontal movements and/or racking of the unit when fully loaded shall not result in permanent deformation.

4.7.6 Structural supports for the upper level shall be narrow in profile so as to afford maximum clearance for the lower level auto(s) and minimize loss in aircraft volume. Supports shall be offset on opposite sides and designed so as to integrate with auto transport units in adjoining aircraft positions, preventing redundant volume loss. Either longitudinal side of the unit shall function facing forward or aft in the aircraft and shall not interfere with other ULD's or auto transport units in adjoining aircraft positions.

4.7.7 Where applicable, design objective for spacing between cars in adjoining positions or a car and a structural member, shall be a minimum of 2 inches (51 mm). Structural members are to be incorporated in the allowable spacing in order to prevent loss of useable space.

4.7.8 The overall height of the unit fully assembled and loaded shall not exceed 118 inches (2997 mm) as measured from conveyor plane (pallet included).

4.7.9 The second level auto tray wheel support surface shall be located 60 inches (1524 mm) above roll plane with pallet base included. As an option, this elevation shall provide a vertical adjustment of ±4 inches (102 mm) in 1 inch increments.

4.7.10 The lower level shall provide a clear envelope for an auto measuring 57 inches (1448 mm) in height. This envelope shall allow vertical clearance for deflections and racking while in transit and freedom of movement during assembly and disassembly/loading and offloading.

5. CARGO LOADING:

5.1 Type A, B, and C units will alternately be used for the carriage of cargo during return haul.

5.1.1 Types of cargo will be general, both unitized and non-unitized.

6. ASSEMBLY AND DISASSEMBLY OF THE UNITS:

6.1 Attach Fittings:

6.1.1 Fittings shall be located so that they cannot damage or be damaged by aircraft hardware and/or adjacent units should they inadvertently be left open or become open in transit.

6.1.2 No tools or equipment shall be required to secure fittings.

6.1.3 Means should be provided to give visual and mechanical indication that fittings are positively secured.

6.1.4 Where possible, fittings and assembly components should be interchangeable.

6.1.5 Handles, straps, fittings, etc., shall withstand a minimum of 5000 lbs (2225 daN) pull in any direction.

6.1.6 When assembled or disassembled there shall be no loose parts which can easily be lost. Small assembly components and parts shall be chain attached.

6.2 Loading and Preparation for Shipment: Assembly/disassembly manning, equipment and time required should be held to a minimum. Following shall be minimum objectives:

6.2.1 Type A (I car, lower deck)

a) maximum manning - one (1) man
b) maximum equipment - one 3000 lbs (1335 daN) forklift or equivalent
c) maximum assembly/disassembly time - 5 minutes

6.2.2 Type B (I car, main deck, slanted)

a) maximum manning - one (1) man
b) maximum equipment - one 3000 lbs (1335 daN) forklift or equivalent
c) maximum assembly/disassembly time including erection to required angle - 10 minutes

6.2.3 Type C (2 or 4 cars, main deck, double level)

a) maximum manning - two (2) men
b) maximum equipment - one 3000 lbs (1335 daN) forklift or equivalent
c) maximum assembly/disassembly time - 15 minutes

6.3 Disassembly and Return Haul Usage:

6.3.1 When disassembled and/or collapsed, units shall occupy minimal space so as to optimize cargo loading of the aircraft.

6.3.2 The optimum designs should permit complete disassembly and bundling of one or more units together during return haul. It is intended that pallets used to support the base of the units may be disconnected and used for carriage of cargo.

7. TARE WEIGHT LIMITS: The tare weight shall be kept at a minimum consistent with the requirements and within limits of good design practices.

7.1 The tare weight objectives (excluding pallet) are as follows:

7.1.1 Type A - 250 lbs (113 kg)

7.1.2 Type B - 350 lbs (159 kg)

7.1.3 Type C - 500 lbs (227 kg) for two cars unit,
or 700 lbs (317 kg) for four cars unit

8. RESTRAINT PROVISIONS:

8.1 Aircraft Restraint Provisions:

8.1.1 Aircraft restraint provisions normal to the pallet being used shall be retained. Wheel trays and attach fittings shall not negate access required by aircraft restraints and/or the ability for one man, without the use of tools, to set the required aircraft restraints.

8.1.2 Provision shall be made to permit tiedown of the automobile and transport unit directly to the pallet and/or aircraft should the operator deem it necessary.

8.1.3 The load path of the unit restraint system shall conform to the NAS 3610 Class II restraint system. The restraint load path should be held to a minimum where possible.

8.1.4 The unit design shall be such that the fully loaded unit, when adequately restrained in the aircraft systems, conforms to appropriate NAS 3610 Class II restraint parameters.

8.1.5 Where possible, restraint devices/fittings should be designed to accomplish multiple functions.

8.2 Auto Restraint Provisions:

8.2.1 Provision shall be made to secure the auto to the unit using design attach points and fittings as provided and/or specified by each automobile manufacturer.

8.2.2 Provision shall be made to secure the auto to the unit and/or pallet using overthrow straps over the automobile frame when attach fitting devices have not been provided by the automobile manufacturers.

8.2.3 Restraint attach fittings shall permit the use of take-up devices to collapse the automobile suspension system as necessary to stabilize the auto while in transit.

8.2.4 Restraint attach fittings shall provide adequate design limits to accept repeated rhythmic loads incurred when an automobile is not stabilized during transit.

9. ENVIRONMENTAL CRITERIA:

9.1 Operating Conditions: Equipment should be capable of operating under the following conditions:

9.1.1 Temperature range of -25 degrees Fahrenheit to +140 degrees Fahrenheit (-32 degrees C to +60 degrees C).

9.1.2 Relative humidity of 100%.

9.1.3 Exposure to salt-sea atmosphere.

9.1.4 Vibration incidental to service use.

9.1.5 Sand and dust particles, wind velocity of 60 MPH (97 kmh).

9.1.6 Exposure to rain, snow and sleet.

9.1.7 All fluids normally contained on automobiles and on aircraft.

9.1.8 Conveyor support criteria per ARP 1334A.

9.2 Materials and Processes:

9.2.1 Materials and process selected should give consideration to extremely hard usage to which the unit will be subjected to provide for a maximum service life.

9.2.2 All metal parts should be protected against corrosion.

9.2.3 All non-metallic parts and/or joints which are liquid absorbent should be sealed and/or treated.

9.2.4 All materials shall be flame-resistant in accordance with regulatory requirements.

9.2.5 All materials and/or components shall be protected against deterioration or loss of strength in service due to exposure, weathering, corrosion or other causes where the type of material used requires such protection.

10. LOADS:

10.1 Car Loads:

10.1.1 Car trays shall support the following loads on any 8 x 8 inch (203 x 203 mm) tire foot print area without permanent deformation.

10.1.2 As much as 60% of total car weight can be supported on one axle. This added weight may appear on either the forward or rear axle, i.e., on either end of the unit. It is envisioned that on type C units cars on the lower and upper level may have to be inverted positions in order to reestablish a CG location within limits.

10.2 Load Ratings: Maximum load capacity of car tray and where applicable all interchangeable parts shall be permanently identified.

10.2.1 Type A: minimum car load capacity = 3,800 lbs (1724 kg)
(gross weight approximately 4,300 lbs (1950 kg)*

10.2.2 Type B: minimum car load capacity = 5,000 lbs (2268 kg)
(gross weight approximately 5,600 lbs (2540 kg)*

10.2.3 Type C: minimum load capacity per car position = 5,000 lbs (2268 kg)
(gross weight approximately 11,000 lbs (4990 kg) for a two car, or 21,200 lbs (9615 kg) for a four car unit)*

*Note: See Para. 10.1.2 above.

10.3 Ultimate Load Criteria - Aircraft:

10.3.1 Type A:

Forward	Aft	Side	Up	Down
1.5 g*	1.5 g*	1.5 g*	3.0 g	6.0 g

CG eccentricity: Longitudinal ±10%, lateral ±10%. CG height: max. 36.0 in (914 mm)

*In combination with a down load equal to the forward load.

10.3.2 Type B and Type C:

Forward	Aft	Side	Up	Down
1.5 g*	1.5 g*	1.5 g*	2.5 g	5.1 g

CG eccentricity: Longitudinal ±14.4%, lateral ±21.4%.
CG height: max. 48.0 in (1219 mm)

*In combination with a down load equal to the forward load.

10.4 Operating Loads - Ground Transportation Minimum Requirements:

10.4.1 Ground transportation requirements shall meet or exceed those outlined in the United States Department of Transportation Motor Carriers Safety Regulations, reference current issue: Part 393.100, Subpart I, "Protection Against Falling or Shifting Cargo".

11. TESTING:

11.1 Scope: The tests are static in nature to minimize complexity and cost of required testing facilities. As far as practical, applied static loads should take into account the combined static and dynamic loads anticipated in service.

11.1.1 It is intended that tests shall be non-destructive in nature and not result in damage unless ultimate load conditions are employed.

11.1.2 Test equipment and methods of testing described are not meant to be restrictive. Alternate equivalent methods to accomplish the desired results may be employed.

11.1.3 In selected cases, tests may be repeated under ultimate load conditions when required for substantiation of analytical data. If this becomes necessary, the unit so tested may not be used in service until all component parts are inspected and those that exhibit permanent deformation are replaced.

11.2 Test Criteria:

11.2.1 A unit shall be considered satisfactory if, upon inspection before and after testing, its dimensions fall within the applicable manufacturing drawings allowances.

11.2.2 Upon completion of the subject test(s) the unit shall show neither permanent deformation or abnormality which will render it unsuitable for use and the dimensional requirements affecting handling, securing and/or interchange shall be satisfied.

11.2.3 Permanent deformation is permitted under ultimate load conditions. A unit shall be considered within acceptable limits if it exhibits permanent deformation but does not deform to extent of discharging an auto/cargo or break free from the restraint system. Parts deformed must be removed and replaced.

11.3 Recommended Test Equipment:

11.3.1 When restraint or movement on conveyor systems is evaluated, the test system shall be in accordance with the following:

Rows of rollers on approximately 20 inch (508 mm) centers with each row composed of 1.5 inch (38 mm) diameter rolls 3 inches (76 mm) long uncrowned with edge radius of 0.06 inches (1,5 mm) spaced on 10 inch (254 mm) centers. Unit will travel both longitudinally and perpendicular to roller axis. Latches and guide rails of suitable strength shall be provided to guide the device along the conveyor and secure it at its restraint points.

11.3.2 When conducting structural tests, sufficient payload to meet test load requirements shall be provided. When appropriate, load producing devices may be used.

11.4 Testing Requirements:

11.4.1 Demonstration (at full capacity loads):

11.4.1.1 Assembly: Demonstrate time elapsed, manning and equipment required.

11.4.1.2 Loading: Demonstrate ability to load and prepare an auto for shipment. Time elapsed, manning and equipment required.

11.4.1.3 Lifting: Demonstrate top lifting and forklift required and ability to control the load during:

a) assembly,
b) positioning of trays with autos on board,
c) placement of loaded units with pallet attached on conveyorized ramp equipment.

11.4.1.4 Disassembly and preparation for return haul. Demonstrate ability to disassemble and bundle equipment and components.