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Regulatory Policy Division
Bureau of Industry and Security
Room 2099B
U.S. Department of Commerce
14th St. and Pennsylvania Ave., NW
Washington, DC 20230

Re: RIN 0694-AF17

Indium Corporation is submitting these comments in response to the Proposed Rule Export Administration Regulations: *Control of Items the President Determines No Longer Warrant Control under United States Munitions List, (76 Federal Register 41958, July 15, 2011).*

In summary, Indium Corporation supports the proposal to move various USML items to the CCL and in particular supports the proposed definition of "specially designed" as discussed on Page 41968 of the Proposed Rule.

Indium Corporation further suggests that BIS consider expanding the cited examples of multi-use parts that should not be included on the USML, and specifically request BIS to consider the proposed § 772.1 "Specially Designed-(d)(1) definition to include "washers" and "solders".

We respectfully request BIS to consider this specific language:

> Examples include threaded fasteners (e.g., screws, bolts, nuts, nut plates, studs, inserts), other fasteners (e.g., clips, rivets, pins), common hardware (e.g., washers, spacers, insulators, grommets, bushings), and other joining materials such as springs, wire and solder.

The reason for including solder and washers is because, and as illustrated in the attached article published by The Adhesive and Sealant Council Incorporated, a variety of joining methods and materials can be used to fulfill assembly functions, including:

- mechanical fasteners (threaded fasteners, other fasteners, common hardware)
- welding materials
- brazing materials
- soldering and adhesive materials

Like fasteners, solder is available in a common variety of forms (bar, wire, ribbon, foil, preform, powder and paste). Solder, like fasteners, welds, brazes, or adhesives, enable the joining or bonding function of two parts. We believe it should be clear that these materials are not military articles subject to the USML.

Sincerely,

Mary Beth Coholan

Mary Beth Coholan
Trade Compliance Manager

Attachment

## Competitive Fasteners

A variety of joining methods can be used to provide the assembly function. A general comparison of these joining processes is provided in Table 1 as to their joint characteristics and their production features.

**Table 1: General Comparison of Joining Characteristics**

*(Source: Harshorn, S. R., "Introduction", Chapter 1, Structural Adhesives: Chemistry and Technology, Plenum Press, New York, 1986)*

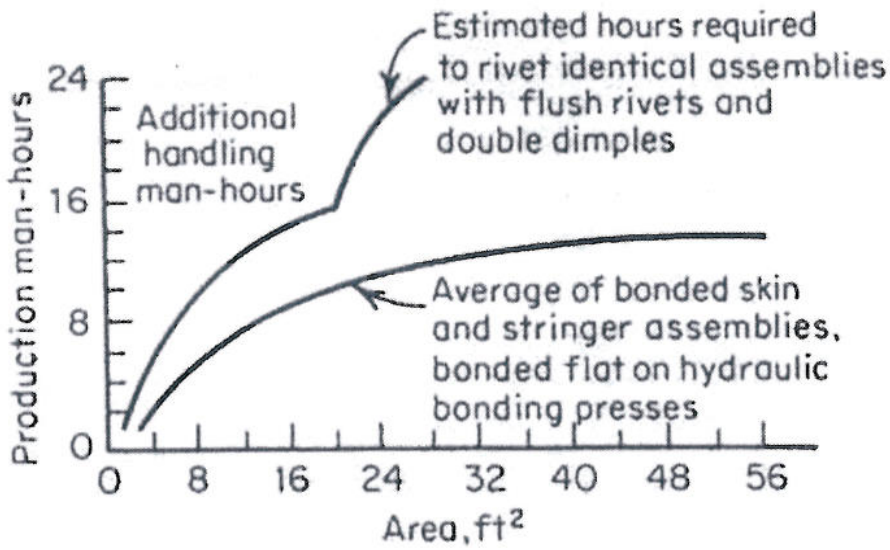
| | ***Welding*** | ***Brazing and Soldering*** | ***Mechanical Fastening*** | ***Adhesive Bonding*** |
|---|---|---|---|---|
| ***Joint Features*** | | | | |
| Permanence | Permanent joints | Usually permanent (soldering may be non-permanent) | Threaded fasteners permit disassembly | Permanent joints |
| Stress distribution | Local stress points in structure | Fairly good stress distribution | Points of high stress at fasteners | Good uniform load distribution over joint area (except in peel) |
| Appearance | Joint appearance usually acceptable. Some dressing necessary for smooth surfaces | Good appearance joints | Surface discontinuities sometimes unacceptable | No surface marking. Joint almost invisible |
| Materials joined | Generally limited to similar material groups | Some capability of joining dissimilar metals | Most forms and combinations of materials can be fastened | Ideal for joining most dissimilar materials |
| Temperature resistance | Very high temperature resistance | Temperature resistance limited by filler metal | High temperature resistance | Poor resistance to elevated temperatures |
| Mechanical resistance | Special provision often necessary to enhance fatigue resistance | Fairly good resistance to vibration | Special provision for fatigue and resistance to loosening at joints | Excellent fatigue properties. Electrical resistance reduces corrosion |
| ***Production Aspects*** | | | | |
| Joint preparation | Little or none on thin material. Edge preparation for thick plates | Prefluxing often required (except for special brazing processes) | Hole preparation and often tapping for threaded fasteners | Cleaning often necessary |
| Post Processing | Heat transfer sometimes necessary | Corrosive fluxes must be cleaned off | Usually no post-processing -- occasionally re-tightening in service | Not often required |
| Equipment | Relatively expensive, bulky and often required heavy power supply | Manual equipment cheap. Special furnaces and automatic unit expensive | Relatively cheap, portable and "on-site" assembly | Only large multi-feature, multi-component dispensers are expensive |
| Consumables | Wire, rods, etc., fairly cheap | Some special brazing fillers expensive. Soft solders cheap | Quite expensive | Structural adhesives somewhat expensive |
| Production rate | Can be very fast | Automatic processes quite fast | Joint preparation and manual tightening slow. Mechanized tightening fairly rapid | Seconds to hours, according to type |
| Quality assurance | NDT methods applicable to most processes | Inspection difficult, particularly on soldered electrical joints | Reasonable confidence in torque control tightening | NDT methods limited |

All fastening and joining systems, including adhesives, fall into one of three general categories: (1) periodic, (2) linear, and (3) area. Periodic joining methods attach two members by occasionally placing through-hole fasteners or other individual mechanisms. This is the most widely used joining technique for structures requiring high mechanical strength and a minimum of sealing or other non-strength functions. Linear processes provide a continuous or occasional edge bead attachment, such as welding. In the area joining process, attachment is achieved by full-face contact and complete union between the two mating surfaces. Soldering, brazing, and adhesive bonding are examples of area attachment.

Although adhesive bonding can be successfully employed in periodic or linear attachment applications, the main benefits and advantages are realized when adhesives are used in the "area" attachment designs. The reasons for this are (1) economic advantage gained in applying a single uniform coating rather than individual components (see Figure 1) and (2) stress distribution over a much larger area. With periodic or linear attachment methods, there is generally significant stress concentration that adversely affects the strength and fatigue properties of the joint.

**Figure 1**
**The Economy of Metal-to-Metal Bonding Compared with Conventional Riveted Structures**

*(Source: Cagle, C. V., Adhesive Bonding Techniques and Applications, McGraw Hill, New York, 1968)*




In evaluating the appropriate joining method for a particular application, a number of factors must be considered. Usually, the decision of which fastening method to use involves several trade-offs. An analysis of requirements, as shown in Table 2, can be useful in identifying potential fastening methods. When this is performed, the possibility of using adhesives over other methods becomes apparent.

**Table 2: How Joining Methods Compare**
*(Source: Nielsen, P. O., "Selecting An Adhesive: Why and How", Chapter 5, Adhesives in Manufacturing, G. L. Schneberger, ed., Marcel Deckker, Inc., New York, 1983)*

| | ***Riveting*** | ***Welding*** | ***Brazing*** | ***Adhesive Bonding*** |
|---|---|---|---|---|
| Preliminary machining | P | E | P | E |
| With thin metals | P | P | F | E |
| Limits on metal combinations | F | P | P | E |

| | | | | |
|---|---|---|---|---|
| Surface preparation | E | G | F | P |
| Tooling | E | F | F | F |
| Need for access to joint | P | P | E | E |
| Heat requirements | E | P | P | F-G |
| Stress distribution | P | F-G | E | E |
| Sealing function | P | F | E | G |
| Rate of strength development | E | E | E | P |
| Distortion of assembly | F | P | F | E |
| Final machining | G-E | F | E | E |
| Final heat treatment | E | F | F | E |
| Solvent resistance | E | E | E | F |
| Effect of temperature | E | E | E | P |
| Ease of repair | G | P | P | F |
| Level of skill required | E | G | E | E |

Notes: E - Excellent, G - Good, F - Fair, P - Poor

In many applications adhesive bonding is the only logical choice. In the aircraft industry, for example, adhesives make the use of thin metal and honeycomb structures feasible because stresses are transmitted more effectively by adhesives than by rivets or welds. Plastics, elastomers, and certain metals (e.g., aluminum and titanium) can be more reliably joined with adhesives than with other methods. Welding is usually at too high a temperature, and mechanical fastening destroys the lightness and aesthetics of the final product.

Adhesive bonding does not have many of the disadvantages of other methods. Welding or brazing, useful on heavy-gauge metal, is expensive and requires great heat. Dissimilar metals usually have different coefficients of thermal expansion or thermal conductivities making them more difficult to weld. Some metals have unstable oxides that also make welding difficult. Many light metals such as aluminum, magnesium, and titanium are difficult to weld and are weakened or distorted by the heat of welding. High temperature metallurgical joining methods can cause thin sheets to distort. Beneficial properties obtained from metallurgical heat-treating processes could be lost because of a high temperature joining process. Adhesives, on the other hand, provide a low temperature, high strength, joint with many of these substrates. They thereby avoid many of the problems commonly encountered with other methods of joining.

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Source: http://www.adhesives.org/AdhesivesSealants/WhyAdhesivesvsOtherFasteners/CompetitiveFasteners.aspx