SAAMI®

SPORTING ARMS AND AMMUNITION MANUFACTURERS' INSTITUTE, INC.

SINCE 1926

Ammunition Manufacturing Guide

SAAMI.ORG

What is SAAMI?

The Sporting Arms and Ammunition Manufacturers' Institute (SAAMI®) is a technical association of the United States' leading manufacturers of firearms, ammunition, and components. SAAMI was founded in 1926 at the request of the U.S. federal government with the mission to create and promulgate technical, performance, interchangeability, and safety standards for firearms, ammunition, and components; and to be the preeminent global resource for the safe and responsible manufacturing, transportation, storage, and use of these products. Specifically, SAAMI is tasked with:

- Creating and publishing industry standards for safety, interchangeability, reliability and quality of sporting firearms and ammunition
- Coordinating technical data
- Promoting safe and responsible firearms use

As an accredited standards developer by the American National Standards Institute (ANSI), SAAMI publishes and maintains five public standards:

- SAAMI Z299.1 – *"Voluntary Industry Performance Standards for Pressure and Velocity of Rimfire Sporting Ammunition for the Use of Commercial Manufacturers."*
- SAAMI Z299.2 – *"Voluntary Industry Performance Standards for Pressure and Velocity of Shotshell Ammunition for the Use of Commercial Manufacturers."*
- SAAMI Z299.3 – *"Voluntary Industry Performance Standards for Pressure and Velocity of Centerfire Pistol and Revolver Ammunition for the Use of Commercial Manufacturers."*
- SAAMI Z299.4 – *"Voluntary Industry Performance Standards for Pressure and Velocity of Centerfire Rifle Ammunition for the Use of Commercial Manufacturers."*
- SAAMI Z299.5 – *"Voluntary Industry Performance Standards Criteria for Evaluation of New Firearms Designs Under Conditions of Abusive Mishandling for the Use of Commercial Manufacturers."*

Introduction

This general overview of the processes and methods in use in the manufacture of commercial sporting ammunition is intended to provide a sense of the scale of operations and the obstacles faced should those facilities be forced to implement product identification and tracking beyond the methods currently in place. The reader's attention is also directed to SAAMI's analysis of the claims made in UNIDIR *Exploring the Technical Feasibility of Marking Small Calibre Ammunition,* 2022.

While the current draft of the Open-Ended Working Group (OEWG) proposal contains language it only applies to "national stockpiles," it also includes, although inconsistently, language that the proposals apply to, more generally, "state-owned stockpiles." The lack of a clear definition of the affected product is where concerns arise for U.S. commercial manufacturers as much of the small caliber ammunition procured for use by U.S. Federal and State law enforcement (LE) agencies is produced on the same production lines as sporting goods products for hunting, target shooting, personal self-defense, and recreational shooting. Therefore, constraints placed on those law enforcement products would directly impact the manufacturing operations of commercial facilities.

Ammunition production facilities in the United States have evolved over time to reach the high levels of efficiency at which they operate today. This includes the movement of products at all stages of manufacturing in large, bulk containers, often holding more than 100,000 individual items. Schemes that presume an ability to be able to manage and keep segregated marked items are completely disconnected from the challenges such approaches create. Additionally, many operations are performed on common equipment with different batches and different types of products passing through a single piece of equipment. Adding unique batch identifiers within a run of a single product type multiplies the interruptions needed to ensure equipment is properly cleaned out between each, further degrading efficiency and raising cost.

It should be noted that while SAAMI represents commercial (not military) manufacturers, the closure of government-owned small arms manufacturing capacity has driven a strategy for the U.S. that in times of peak demand is to turn to enlist the commercial base to meet demand shortfalls. Should this become the case, operating constraints presented by these proposals would fall directly on those producers.

It should also be understood that the production volumes of commercial, sporting ammunition in the U.S. far exceeds not only the single U.S. government-owned small arms production facility (Lake City Army Ammunition Plant [LCAAP] in Independence, MO), but also in comparison to all other countries' commercial capabilities. The challenges faced by those (non-U.S.) small manufacturing plants are

in no way comparable to those encountered when trying to scale these approaches to the volumes produced daily by major manufacturers in the U.S.

Some other key differences between military and commercial operations are:

PRODUCT LINE DIVERSITY

U.S. Military uses primarily only four (4) different cartridges: 9mm NATO /9mm MHS, 5.56 mm, 7.62 mm, and .50 caliber whereas there are currently over 130 different rifle cartridges and almost 40 different handgun cartridges standardized by SAAMI and in production at commercial facilities. (It is important to note here that the U.S. Army Ammunition Plant has no internal capability to produce 9mm NATO rounds, requiring these to be procured from commercial manufacturing entities.)

PRODUCTION LINE ORGANIZATION

Military production typically maintains dedicated production lines for specific cartridges (e.g., 5.56 mm and 7.62 mm). Commercial production facilities, while potentially having a small number of dedicated lines, are mostly made up of equipment that runs many different cartridge types and is changed from one type to another, possibly multiple times per week.

PRODUCTION VOLUMES

The only U.S. government small arms facility, Lake City Army Ammunition Plant in Independence, MO, has an annual production capacity of *up to* 1.6 billion rounds annually[1]. The largest domestic commercial sporting ammunition facilities routinely produce at that level, and higher, across rifle, handgun, shotgun and rimfire ammunition.

DISTRIBUTION

Military ammunition is distributed through specific and limited government depots. Commercial sporting ammunition is shipped to retail distribution centers, online retailers, individual dealers, and direct to consumers. Retail distribution centers reship products to multiple individual retail store locations for sale to consumers. (Walmart is a major sporting ammunition retailer and a perfect example of this exponential growth in transaction points.)

CHALLENGES TO MARKING (Including Law Enforcement ammunition)

Many local (town, city, and county) law enforcement (LE) agencies buy standard commercial ammunition through retail outlets or law enforcement distributors. Much of this ammunition is not LE-specific, and its destination is unknown to the production facility at the time of manufacture. Schemes that include marking LE, but not commercial products, fail to understand this aspect.

Furthermore, many products needed by the U.S. military are not able to be produced at LCAAP and are sourced from commercial operations. These include rounds for handguns and shotguns. Therefore, additional marking requirements will directly impact the operational efficiency and cost of ammunition made in those facilities.

PRODUCTION RATES (Speed)

Commercial production facilities are designed to provide maximum efficiency and production rates. Modern loading equipment can produce ammunition at rates exceeding 1,400 *rounds per minute from a single machine* – and commercial facilities operate many loading machines. A major commercial plant can easily house 70 loading machines or more, all running simultaneously. A provider of laser-marking equipment familiar with ammunition loading estimated as many as ***six*** laser marking machines would be needed to keep pace with a *single loading machine*. The capital investment necessary to just apply markings, ignoring the costs associated with data systems for tracking, recordkeeping and maintenance of those systems would be prohibitive.

Contact Information

For further information or for answers to questions, inquiries should be directed to:

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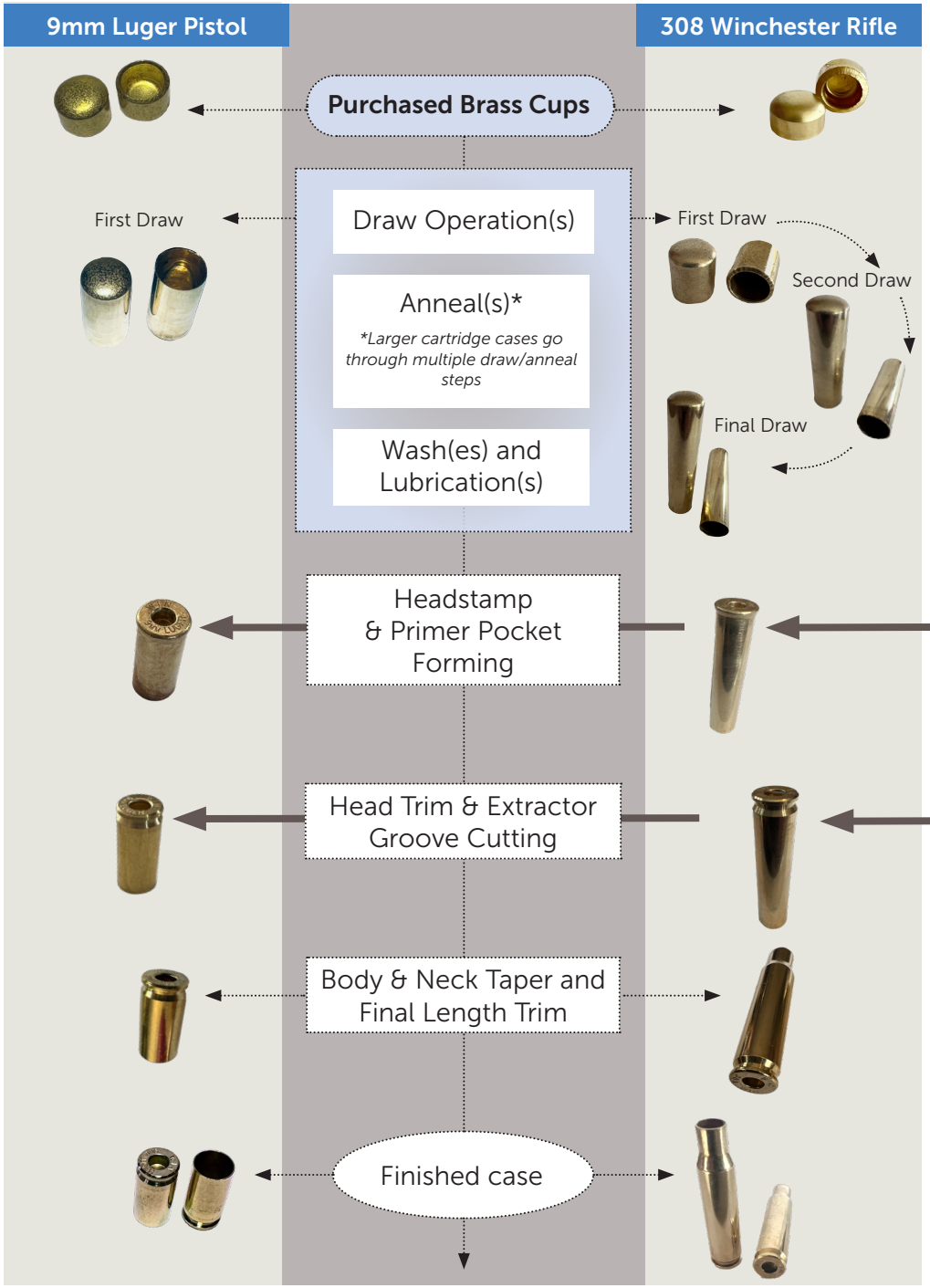
[1] ARMY AMMUNITION – Actions Needed to Improve Management of Procurement and Production Practices, October 2022, GAO report number GAO-23-105352.

CARTRIDGE CASE MANUFACTURING



The cartridge manufacturing process begins with purchased brass cups. These will be forced through dies by a punch that reduces the diameter and lengthens the wall. This process is called a "draw operation."

As the metal is stretched and reformed by "drawing," it hardens and must be softened before further draws can be made.

Annealing softens the metal and allows it to be drawn again. After annealing, the pieces are washed to remove residue from burned off lubricant and new lubricant applied.

This step forms the pocket for the primer and imprints the cartridge identification on the head of the shell. For commercial products, this includes the manufacturer/brand and cartridge type (for example, 9mm Luger or 38 Special).

KEY POINT: *This information can cover up to 90% or more of the space available on the head. The tool used to impress the printing has a life of up to 200,000 parts. Changing this tool more frequently lowers efficiency and increases costs. The final customer is typically unknown to the manufacturing place at this time.*

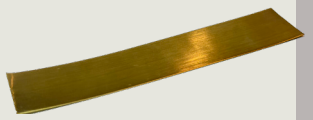
After the head is formed, the shell has the extractor groove formed, most commonly on a machine that operates like a lathe.

Between each of the steps on this and the following pages, the in-process parts are moved in bulk containers, with only an interest in preventing the mixing of different cartridge types.

This practice, designed for efficiency, makes unique identifier segregation impossible without significant capital investment and would increase day-to-day operating costs.

PRIMER MANUFACTURING

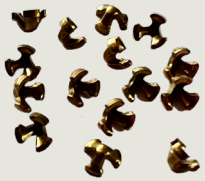
9mm Luger Pistol



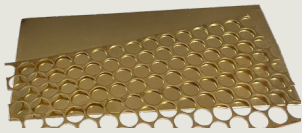
Purchased Brass Strip

Cup

Anvil



308 Winchester Rifle



Cup

Anvil

Primer Parts Fabrication

Wash

Primer Assembly

Dry

Finished Primer

Packaging

Ship to Other Ammunition Assembly Operations and Retail Distributors

To Ammunition Assembly

Purchased Primer Ingredients

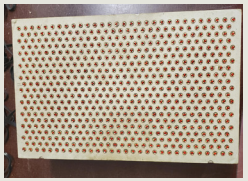
Many operations in this stage are regulated by U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives (BATFE)

Explosive Synthesis

Explosives Storage

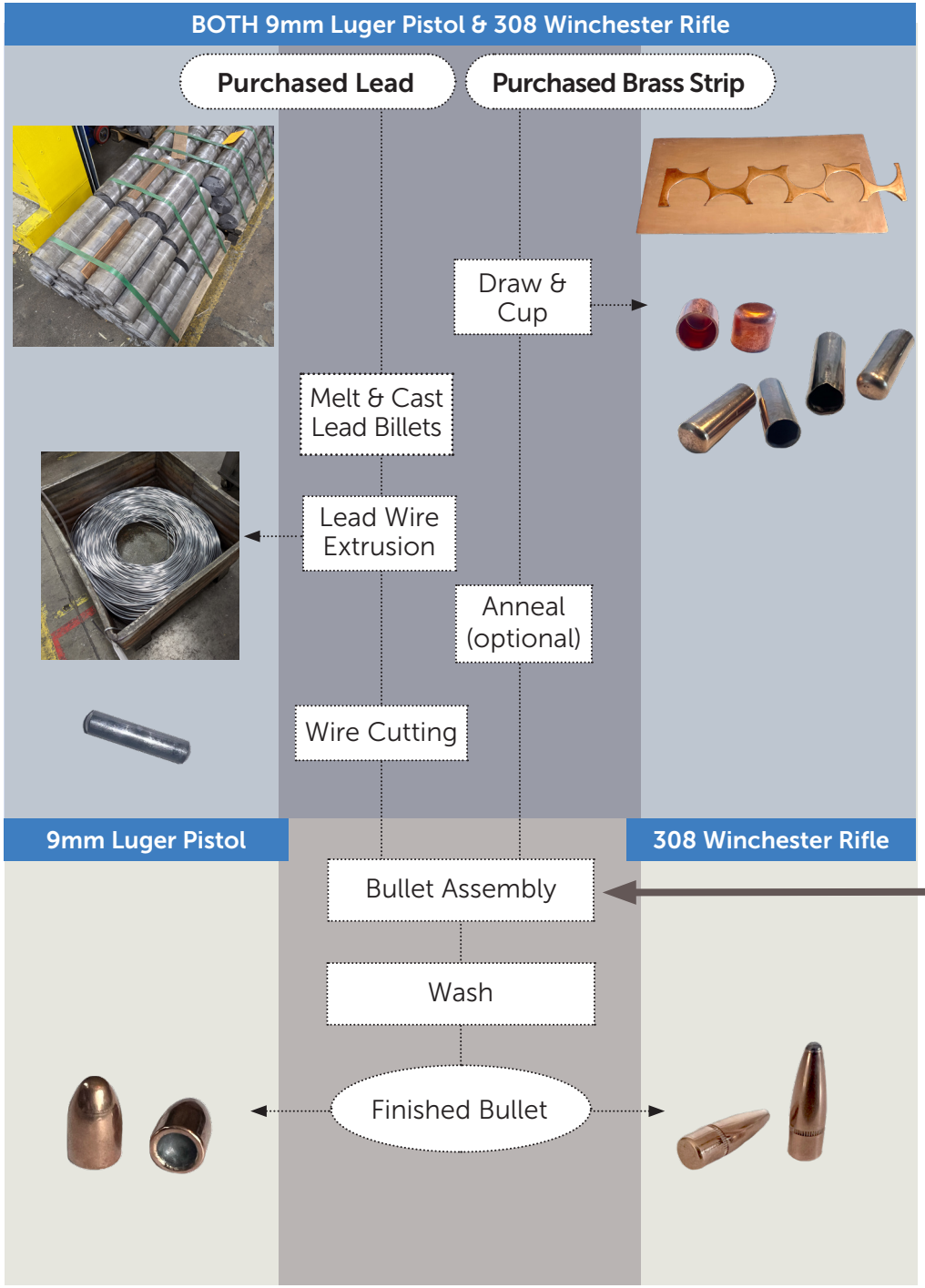
Primer Mix Mixing

A lot number for internal use is created to the production from a single cell here. It is tracked on paper tickets.



Primers are also sold to other commercial loading facilities and at retail for home (private) reloaders.

BULLET MANUFACTURING



Bullets are produced at rates up to and exceeding 10 MILLION parts per day at a typical major commercial U.S. manufacturer.

As with other parts and loaded rounds, unless the bullet is specific to a particular customer, which is unusual, the ultimate consumer is typically unknown at the time of manufacture.

Cartridge cases are also handled in bulk containers for movement between operations. These containers can hold 100,000 parts or more, making segregation and tracking at the individual part level impossible.

At the bullet assembly step, the lead core is placed in the drawn bullet jacket and impacted to compress the core and expand it to fill the jacket. Then the filled jacket goes through forming steps to create the final outer profile of the bullet.

AMMUNITION ASSEMBLY

9mm Luger Pistol

Finished case

★ Packaging

Ship to Other Ammunition Assembly Operations and Retail Distributors

Case Priming

Purchased Smokeless Propellant

Loading

A production code number is assigned to the production from a single loader or packing machine for one full production shift. It is tracked on paper tickets and applied to the packaging for later use in the event a quality issue is discovered. Once applied to packaging, no facilities exist to track the product with that code.

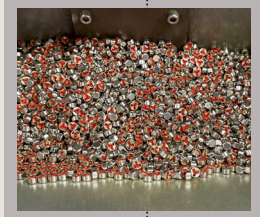
★ Packaging

Ship to Distribution Center or off-site warehouse

Ship to first distribution point

308 Winchester Rifle

Finished Primer



Finished Bullet

Packaging

Ship to Other Ammunition Assembly Operations and Retail Distributors

★ 

Empty cartridge cases are sold in bulk to other commercial loading facilities and in smaller retail packages for home (private) reloaders.

Primers and loaded ammunition contain explosive materials which are subject to degradation and possible ignition from heat sources, such as lasers.

Furthermore, many types of commercial loading machines are capable of producing loaded rounds at a rate far exceeding the capacity of laser marking equipment to keep pace. Some loaders can produce loaded rounds at a rate over 20X faster than a single laser can mark.

As the final product shipments are made from the manufacturer's distribution center to the first customer's warehouse, most often the ultimate customer is unknown at the time of manufacture unless the packaging or product configuration is specific to one customer. In the U.S., most ammunition shipments go from the manufacturer's warehouse to a warehouse, either for a large retailer or a distributor, and is subsequently reshipped at least one more time before reaching the final retail destination. In these subsequent shipments, the full cases may be broken down into smaller shipments of individual boxes. Under proposed schemes, each of the entities handling these products would need to facilitate to add reading, storage, and tracking for any identifiers into their systems and then dispose of those upon reshipment. The enormity of this task is daunting considering each major manufacturer in the U.S. produces in excess of 10 MILLION ROUNDS PER DAY each.

★ *Packaging for commercial products takes many forms — 20-round, 25-round, 50-round, 100-round, and 200-round boxes and bulk packages of up to 1,400 rounds in a single retail can, case, or bucket.*

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