

# Proposed Changes to NATO Hazard Division 1.2 Criteria for Storage Sub-divisions 1.2.1, 1.2.2, & 1.2.3

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# ACKNOWLEDGEMENTS

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Sponsored participation and preparation of paper

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## **NATO AC/326 SG C HD 1.2 Technical Working Group (TWG)**

Provided access to relevant documents

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# OUTLINE

- Bottom Line Up Front
- Background
- Current US DoD/NATO HD 1.2 SsDs and MCE
- Overview of revisions to NATO HD 1.2 criteria (June 2015)
- Overview of proposals to change NATO SsD 1.2.3 criteria
- Impact of proposed NATO SsD 1.2.3 changes on SsD 1.2.3 QD
- Way ahead
- Summary



# BOTTOM LINE UP FRONT

## Objective

To inform the International Insensitive Munitions/Munitions Safety communities on the status of the actions of the NATO AC/326\* Sub-Group C\*\*

HD 1.2 Technical Working Group to revise the NATO requirements and quantity-distance criteria for the

HD 1.2 Storage Sub-Divisions.

- SsD 1.2.1
- SsD 1.2.2
- SsD 1.2.3

\*CNAD Ammunition Safety Group

\*\*In-service and Operational Safety Management



# BACKGROUND

## NATO Hazard Classification System

HD	SsD	Type of Hazard
1.1		Mass explosion hazard.
1.2		Projection hazard, but not a mass explosion hazard.
	1.2.1	<b>Produces fragments with a considerable range, generally HE projectiles with NEQ greater than 0.73kg (1.6lbs).</b>
	1.2.2	<b>Produces fragments of a moderate range, includes HE projectiles with an NEQ less than or equal to 0.73kg and other items not containing HE such as cartridges, rounds with inert projectiles, and pyrotechnic items.</b>
	1.2.3	<b>Special SsD, with unique set of QDs, applicable to munitions that exhibit at most an explosion reaction in SR testing and a burning reaction in BI, SCO, and FCO testing.</b>
1.3		Fire hazard, minor blast or projection hazard, but not a mass explosion hazard.
	1.3.1	Mass fire hazard.
	1.3.2	Burn one after another, producing minor blast and/or projection effects - Firebrands and burning containers may be projected.
1.4		No significant hazard, effects largely confined to package, no projected fragments of appreciable size expected.
1.5		Very insensitive substances - mass explosion hazard, but so insensitive very little probability of initiation or of transition from burning to detonation under normal conditions.
1.6		Extremely insensitive articles - no mass explosion hazard, only contain extremely insensitive substances, and demonstrates a negligible probability of accidental initiation or propagation. <b>Note:</b> The risk from these articles is limited to the explosion of a single article.



# BACKGROUND

## References - NATO/US Criteria

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- NATO AASTP-1, Ed 1, Change 3, **Manual of NATO Safety Principles for the Storage of Military Ammunition and Explosives**, May 2010.
  - NATO AASTP-3, Ed 1, Change 3, **Manual of NATO Safety Principles for the Hazard Classification of Military Ammunition and Explosives**, August 2009.
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- DoD Manual 6055.09, Change 1, **DoD Ammunition and Explosives Safety Standards** (Volumes 1-8), 12 March 2012.  
<https://www.ddesb.pentagon.mil/>
  - TB 700-2/NAVSEAINST 8020.8C/TO 11A-1-47, Joint Technical Bulletin, **Department of Defense Ammunition and Explosives Hazard Classification Procedures**, 30 July 2012.  
<https://www.ddesb.pentagon.mil/>



# BACKGROUND

## NATO AC/326 SG C HD 1.2 TWG Meetings

- 22-24 May 2012 – Meeting of the Lead Nations, US and the United Kingdom (UK), for the HD 1.2 initiative.
- 15-17 August 2012 – 1<sup>st</sup> NATO AC/326 SG C HD 1.2 TWG meeting. Participating nations: Germany (GE), Norway (NO), UK, and US.
- 13-15 August 2013 – 2<sup>nd</sup> NATO AC/326 SG C HD 1.2 TWG meeting. Participating nations: Canada (CA), GE, UK, and US.

### PRODUCT

Working Paper AC/326(SG/C)WP(2013)0003 (PFP)REV 2, CNAD Ammunition Safety Group (AC/326) Subgroup C on In-Service and Operational Safety Management, **Proposed Change to HD 1.2 Criteria, AASTP-1 Edition (B) Version 1** (6 Dec 13).

- 08-09 July 2014 – 3<sup>rd</sup> NATO AC/326 SG C HD 1.2 TWG meeting. Participating nations: Belgium (BE), CA, France (FR), UK, and US. The NATO Project Office Munitions Safety Information Analysis Center (MSIAC) was also represented.

### PRODUCT

Meeting Minutes, **3<sup>rd</sup> Hazard Division 1.2 Technical Working Group** (8-9 July 2014).



# US DoD/NATO HD 1.2

## Maximum Credible Events (Current)

**NATO defines a MCE for two of the three SsDs for HD 1.2**

- The MCE for SsD 1.2.1 is the NEQ of an item times the number of items in three unpalletized, outer shipping packages (Rule of 3), unless a different MCE is demonstrated by testing or analogy.
- The MCE for SsD 1.2.3 is the NEQ of one item/package (US DoD Only).

**NOTE: For AASTP-1 (2010) the US MCE concept was accepted by NATO for SsD 1.2.3, but not applied for SsD 1.2.1 QD calculations.**





# SUMMARY OF MAJOR NATO HD 1.2 REVISIONS (June 2015)

- Change SsD 1.2.1/1.2.2 from 0.73kg(1.6lbs), **SLIDE 5**, to 0.136kg (0.30lbs).
- Only include HE weight (detonates by design) to determine NEQ for SsD 1.2.1 and SsD 1.2.2 items.
- Indicate that SsD 1.2.2 typically comprise ammunition that does not contain HE, e.g., inerts, pyrotechnics, WPs, illums. **NOTE:** Rocket motors are an exception and should be assessed as they may be more appropriately addressed by assignment to SsD 1.2.1.
- Indicate that, typically, the MCE for new HD 1.2 ammunition is to be determined by testing or analogy, not by the “Rule of 3” **SLIDE 8**.
- Apply MCE concept to SsD 1.2.1 ammunition and account for structural debris generation in HD 1.2 QD Matrix tables- MCE breakdown:  $MCE \leq 50KG$  (original tables) &  $50KG < MCE \leq 500kg$  (new tables)

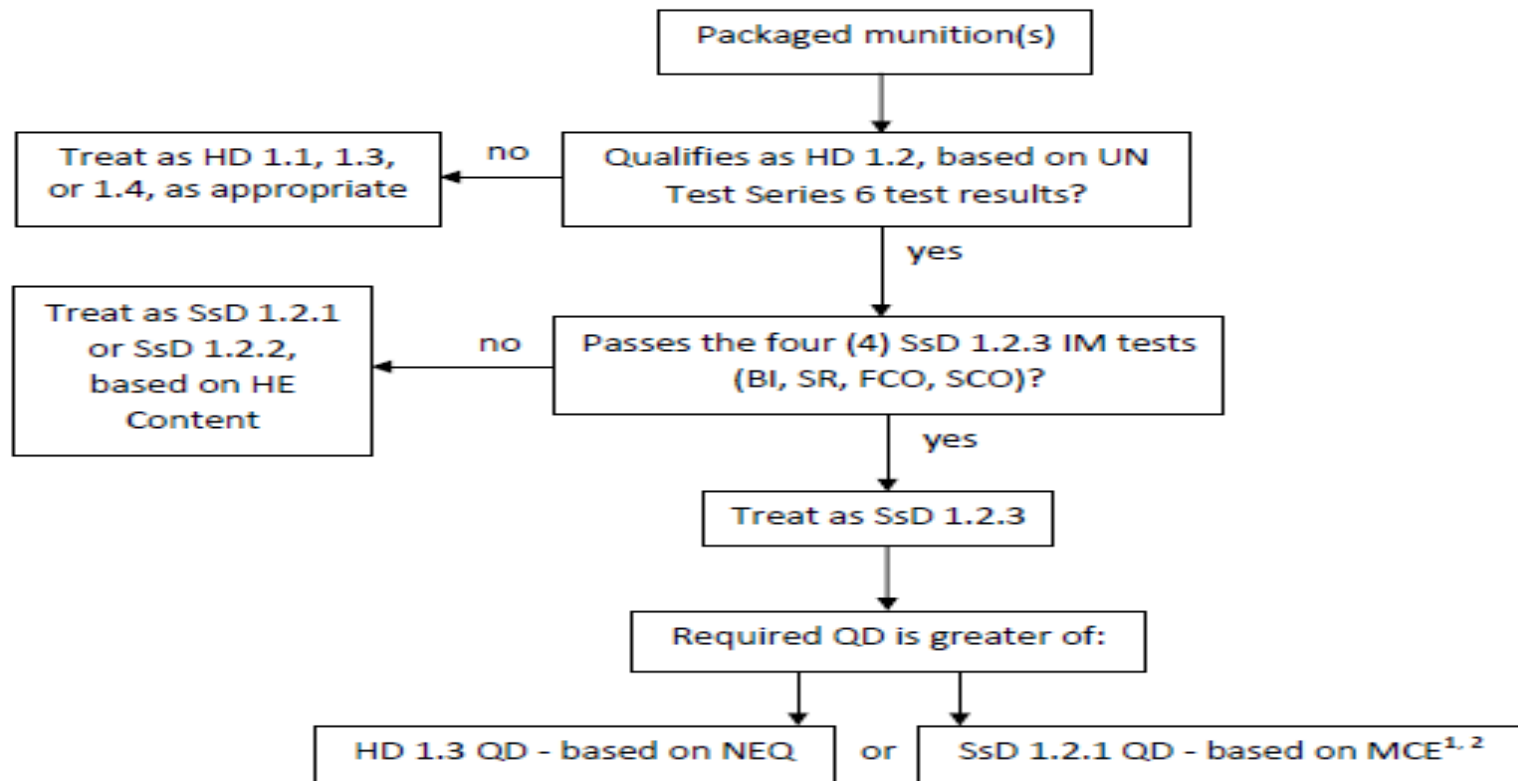


# SUMMARY OF PROPOSALS TO CHANGE NATO SsD 1.2.3 CRITERIA

- Recommend changing the approach for determining the minimum fragment distance:
  - From – Using the HD 1.1 minimum fragmentation density distance ( $1/56 \text{ m}^2$ ), based on debris collection from a design mode intentional detonation.
  - To – Using the SsD 1.2.3 MCE value (NEQ for one round/package) in the SsD 1.2.1 QD columns in the SsD 1.2.1 & SsD 1.2.2 QD table (Table 2G).  
**NOTE:** SsD 1.2.3 items that would otherwise satisfy the criteria for SsD 1.2.2 will need to use the SsD 1.2.1 (larger QDs) columns.
- Recommend that the SsD 1.2.3 MCE only be used to determine the entry value into the SsD 1.2.1 QD tables, and will not play a role in determining a structural debris contribution from the PES breakup as is required for SsD 1.2.1.
- Recommend that a separate SsD 1.2.3 QD table be prepared.
- Recommend the following SsD 1.2.3 QD flowchart (process) be adopted.

# PROPOSED SsD 1.2.3 QD CRITERIA PROCESS FLOWCHART

Agreed Proposed SsD 1.2.3 QD Criteria Process Flowchart  
9 July 2014 – 3<sup>rd</sup> TWG



**Notes:**

<sup>1</sup> The (xx) fragment distance is no longer required for QD purposes

<sup>2</sup> MCE is not used for structural debris QD purposes



# PROPOSED NATO SsD 1.2.3 CHANGES IMPACT ON US DoD/NATO QD

## Current and Proposed SsD 1.2.3 Criteria Assessment Results

Munition	MCE	# of Items	Total NEQ	Current NATO IBD is greater of		Proposed NATO IBD (from Figure 1) is greater of		Current US IBD is greater of		Proposed US IBD (from Figure 1) is greater of	
				Fragment Distance (1/56m <sup>2</sup> )	D4 HD 1.3 (using NEQ)	D2 SsD 1.2.1 Table (using MCE)	D4 HD 1.3 (using NEQ)	Fragment Distance (1/56m <sup>2</sup> )	HD 1.3 table (using NEW)	SsD 1.2.1 table (using MCE)	HD 1.3 table (using NEW)
	(kg)		(kg)	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
A	2.8	1000	2800	91	93	60*	93	91	38	61*	38
B	16.8	1000	16800	152	165	60*	165	152	67	61*	67
C	90	1000	90000	120	290	125	290	120	117	122	117
D	109	1000	109000	274	310	135	310	274	126	134	126
E	446	1000	446,000	282	489	215	489	282	242	213	242



# OBSERVATIONS - CURRENT AND PROPOSED

## SsD 1.2.3 QD ASSESSMENT

- NATO HD 1.3 QD criteria (component of SsD 1.2.3 QD criteria) are significantly greater than the US DoD HD 1.3 QD criteria (yellow vs green highlighting in the table).
- Despite reductions from using the SsD 1.2.3 MCE for entering the NATO SsD 1.2.1 QD Table (for calculating fragmentation related QD), there is minimal impact on the NATO SsD 1.2.3 criteria. **NOTE:** NATO HD 1.3 QD criteria will continue to drive the required SsD 1.2.3 QD (yellow highlighting in table). Only exception, which might occur, is for a small NEQ of SsD 1.2.3 ammunition that have a low MCE.
- Both NATO and US DoD apply a minimum 60m/61m fragment distance respectively for SsD 1.2.1. This minimum distance will govern QD for small NEQs of SsD 1.2.3, and for SsD 1.2.3 items with low MCEs.
- The proposed revised SsD 1.2.3 QD criteria process would have a significant effect towards reducing US DoD-required QD for SsD 1.2.3 (see green highlighting in the table). This result varies significantly from the NATO result because of significant differences between NATO and US DoD HD 1.3 QD.
- The DDESB has been and is continuing to work towards closer harmonized US DoD/NATO criteria in order to improve interoperability during NATO operations.



# WAY AHEAD

- The US (DDESB) is to prepare / submit a US Informal Working Paper (IWP) to NATO AC/326 SG C with a goal to make SsD 1.2.3 criteria consistent with SsDs 1.2.1 and 1.2.2 criteria and to simplify SsD 1.2.3 criteria.
- The need for NATO and the US DoD to apply SsD 1.2.1 minimum distances (60m / 61m, respectively) to SsD 1.2.3 munitions needs to be discussed further.
- HD 1.6 QD criteria is to be re-visited after the full scope of the proposed, revised SsD 1.2.3 QD criteria have been laid out, assessed, and understood.
- NATO AC/326 SG C is looking into a possible change to the next revision of AASTP-1 that incorporates guidance related to in-process hazard classification (e.g., a SsD 1.2.1 item is brought into a building and removed from its packaging, thereby invalidating its hazard classification).

# SUMMARY

## **The paper provides a summary of the:**

- Revisions to the NATO HD 1.2 SsDs' requirements and criteria based on the results and recommendations of the 2<sup>nd</sup> TWG, which are expected to be ratified by the AC/326 nations in June 2015.
- 3<sup>rd</sup> TWG discussion / recommendations to change the NATO HD 1.2 (SsD 1.2.3) requirements and criteria.
- Results of the 3<sup>rd</sup> TWG exercise to assess the implications of the proposed changes to the SsD 1.2.3 requirements and criteria to NATO and US explosives QD safety siting scenarios.
- Way ahead for the TWG.