Guide to Obtaining DOT Approval of Jet Perforating Guns using AESC/IME Perforating Gun Specifications

Effective Date: December 23, 2008

1. What is required?

Transportation of Jet perforating guns (hereafter referred to as "perforating guns") in the USA is subject to the provisions of the Hazardous Materials Regulations (HMR)[1] of the U.S. Department of Transportation (DOT). In the HMR, DOT describes perforating guns as follows:

> *Jet perforating guns, charged, oil well, without detonator.* Articles consisting of a steel tube or metallic strip, into which are inserted shaped charges connected by detonating cord, without means of initiation.[2]

As explosive devices, the following DOT requirements, administered by its Pipeline and Hazardous Materials Safety Administration (PHMSA), apply to perforating guns:

- Classification and approval
- Registration of parties who offer and/or transport hazardous materials
- Training of hazmat employees
- Hazard communication (marking, labeling, placarding and shipping papers)
- Provision of emergency response information
- Security plans
- Packaging of hazardous materials
- Modal transportation requirements

This document discusses classification and approval of perforating guns, specifically when using AESC/IME Perforating Gun Specifications.

2. What are the AESC/IME Perforating Gun Specifications?

Before transporting or offering perforating guns for transport, they must be approved by the Associate Administrator of PHMSA[3]. This approval, signified by a Classification of Explosives (also known as EX-letter), sets forth the UN number, proper shipping name, UN division and compatibility group to be assigned to perforating guns as well as the terms and conditions for the use of said classification.

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[1] 49 CFR Subchapter C
[2] 49 CFR 173.59
[3] 49 CFR 173.51

- Every perforating gun that is transported on US roads and highways must be approved by PHMSA before transportation can commence.

- Every person (company) that loads perforating guns and either transports them, or offers them for transport, on US roads and highways must obtain approval from PHMSA before they do so.

The approval process can be expensive, complicated, and time-consuming, and often requires testing by an approved laboratory before the approval application will be considered by PHMSA. The Association of Energy Service Companies (AESC) and the Institute of Makers of Explosives (IME) have devised the AESC/IME Perforating Gun Specifications (see Annex 1) to provide a resource for reducing the expense, effort, and time required to obtain classification and approval of perforating guns.

The AESC/IME Perforating Gun Specifications are a series of documents setting forth standardized parameters for various perforating gun systems. These series of documents include a drawing representative of the perforating gun system described, technical details for the system, authorized components of the systems, and compliance requirements that govern the applicability of the perforating gun specification. The perforating gun systems covered by the AESC/IME Perforating Gun Specifications are:

- Ported tube systems (with and without detonator)
- Tube & strip systems (with and without detonator)
- Tube & tube systems (with and without detonator)
- Strip carrier systems (with and without detonator)
- Wire carrier systems (with and without detonator)
- Link carrier systems (with and without detonator)
- Swing carrier systems (without detonator)

The AESC/IME Perforating Gun Specifications have been previously reviewed and approved by PHMSA for the use of perforating gun assemblers. Use of the specifications will enable the applicant to obtain PHMSA approval of their qualifying perforating guns systems without the need for testing and with a minimum of effort and delay.

3. Classifications available using AESC/IME Perforating Gun Specifications

Classification for perforating guns without detonators affixed to them and with detonators affixed to them may be obtained using the AESC/IME Perforating Gun Specifications:

3.1. Perforating gun systems without detonator

3.1.1. 1.1D – PHMSA will issue approvals for qualifying perforating gun systems as UN0124; JET PERFORATING GUNS, CHARGED; 1.1D.

3.1.2. 1.4D – PHMSA will issue approvals for qualifying perforating gun systems that also meet the requirements of Special Provision 114[4] and Packing Method US 1[5] as UN0494: JET PERFORATING GUNS, CHARGED; 1.4D. See Annex 2 for the text of Special Provision 114 and Annex 3 for the text of Packing Method US 1.

[4] 49 CFR 172.102
[5] 49 CFR 173.62

3.2. Perforating gun systems with detonator

3.2.1. 1.1D – PHMSA will issue approvals for qualifying perforating gun systems as NA0124; JET PERFORATING GUNS, CHARGED OIL WELL, WITH DETONATOR; 1.1D. PHMSA will impose special controls for use of this classification including, but not limited to, use of a detonator interrupter device and compliance with Packing Method US 1.

3.2.2. 1.4D – PHMSA will issue approvals for qualifying perforating gun systems as NA0494; JET PERFORATING GUNS, CHARGED OIL WELL, WITH DETONATOR; 1.4D. PHMSA will impose special controls for use of this classification including, but not limited to, use of a detonator interrupter device and compliance with Packing Method US 1.

4. ATF License/Permit required

Parties who seek authorization of perforating gun systems using the AESC/IME Perforating Gun Specifications must be authorized by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)[6] to possess explosives and must be in possession of the appropriate ATF license or permit. Within the scope of this document:

4.1. Manufacturers must have an ATF type 20 license for each manufacturing location that will be seeking PHMSA approval of perforating guns.

4.2. Importers must have an ATF type 23 license for each importing location that will be seeking PHMSA approval of perforating guns.

4.3. Dealers must have an ATF type 26 license for each dealing location that will be seeking PHMSA approval of perforating guns.

4.4. Users must have an ATF type 33 permit. One type 33 permit per company is valid for all user locations that the company operates within the USA.

5. Approval of perforating gun systems

5.1. General requirements

5.1.1. Perforating guns to be approved using an AESC/IME Perforating Gun Specification must be consistent with the configuration in the drawing of the applicable gun system.

5.1.2. All explosive components to be loaded into perforating guns must themselves be PHMSA approved. Copies of these approvals must be maintained at each location where jet perforating guns are assembled.

5.1.3. To ensure that critical components described in the AESC/IME Perforating Guns Specifications are what AESC and IME members intended when developing the specification, certain components must be manufactured, imported, or distributed by an AESC or IME member company. The specific components to which this

[6] U.S. Department of Justice

requirement apply are identified on each specification document and are typically:

- Gun bodies
- Carrier tubes, carrier strips, carrier wires
- Charge holders
- Shaped charges (perforators)
- Detonating cord
- Explosive transfer devices
- Detonators (when authorized to be present, i.e., NA0124 and NA0494)

5.2. Approval application

5.2.1. Each ATF licensed or permitted location from which perforating guns are to be transported or offered for transport must apply for perforating gun approvals.

5.2.1.1. Since ATF licenses are location specific, each licensed manufacturer, importer, and/or dealer location that will transport or offer perforating guns for transport must apply for an approval of each perforating gun system it intends to transport or offer for transport.

5.2.1.2. Since ATF user permits apply to all user locations that a company operates in the USA, only a single application is required for the user permittee for each perforating gun system that it intends to transport or offer for transport.

5.2.2. A single application must be submitted for each perforating gun system to be approved. For example, if location A plans to utilize ported gun systems, tube/tube gun systems, and strip gun systems, then location A would submit 3 approval applications.

5.2.3. Applications for approval of perforating guns using AESC/IME Perforating Gun Specifications must:

5.2.3.1. Identify the section of the HMR under which the application is submitted.

5.2.3.2. Identify the applicant.

5.2.3.3. Identify the perforating gun system to be approved.

5.2.3.4. Identify the classification for which approval is desired.

5.2.3.5. Identify the transport modes for which approval is desired.

5.2.3.6. Include a copy of the appropriate, current ATF license or permit. In the event that the license or permit has expired and the company is operating under an ATF issued Letter of Authorization (i.e., extension letter), a copy of that Authorization is also to be included.

5.2.3.7. Include a copy of the AESC/IME Perforating Gun Specification that will serve as the basis for approval and contain a certification of adherence to the specifications and requirements contained on that document.

Annex 4 contains an example application that is recommended for use in preparing applications in fulfillment of these requirements.

5.3. Use of approval

Compliance with applicable requirements of the HMR when shipping perforating guns approved using an AESC/IME Perforating Gun Specification is required, including, but not limited to:

5.3.1. Perforating guns cannot be transported or offered for transport until DOT has issued an approval in the form of a Classification of Explosives (EX-letter). A copy of the approval must be on file in every location[7] from which loaded perforating guns are transported or offered for transport.

5.3.2. All perforating guns approved using an AESC/IME Perforating Gun Specification must always meet Packing Instruction US 1 of 49 CFR 173.62 (see Annex 2).

5.3.3. All perforating guns approved as UN0494 (1.4D) using an AESC/IME Perforating Gun Specification must always meet the requirements of Special Provision 114 of 49 CFR 172.102 (see Annex 1).

5.3.4. All perforating guns approved using an AESC/IME Perforating Gun Specification must be described on shipping papers as required in 49 CFR 172, Subpart C.

5.3.5. All perforating guns approved using an AESC/IME Perforating Gun Specification must comply with the DOT's marking requirements found in 49 CFR 172, Subpart D.

5.3.6. All perforating guns approved using an AESC/IME Perforating Gun Specification must comply with the DOT's labeling requirements found in 49 CFR 172, Subpart E.

5.3.7. All vehicles transporting perforating guns approved using an AESC/IME Perforating Gun Specification must comply with the DOT's placarding requirements found in 49 CFR 172, Subpart F.

[7] Although ATF User Permittees are required to submit only 1 application to cover all user locations in the USA, they must have a copy of the approval on file in each and every user location from which perforating guns are transported or offered for transport.

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Annex 1

AESC/IME Perforating Gun Specifications

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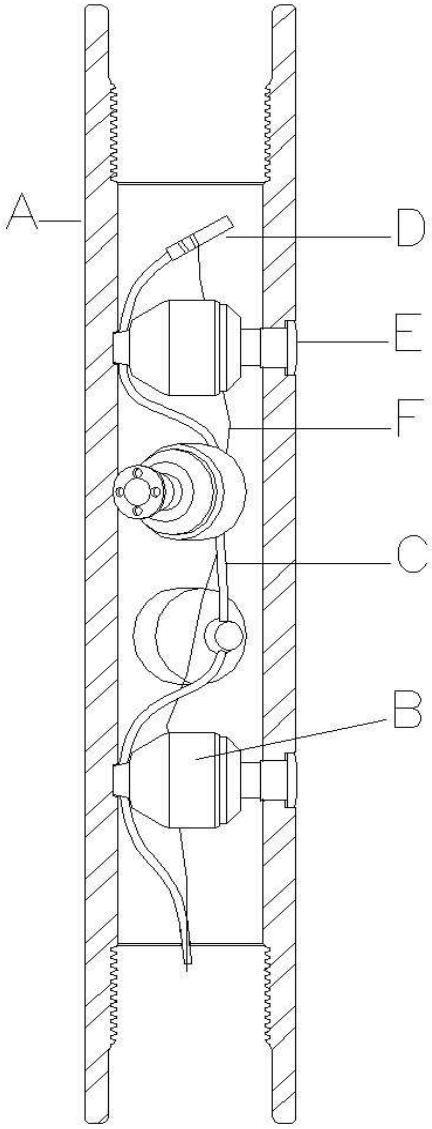
Perforating Gun Specification

Ported Tube System (w/o Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	0.5	21
Diameter (in)	2.500	6
Perforators		
#/gun	1	81
Device NEW (g)	2	39
Perforating gun NEW (kg)	0.0020	3.1590
Detonating Cord		
ft/gun	0.5	26
Device NEW (g/ft)	3.89	5.18
Perforating gun NEW (kg)	0.0019	0.1347
Explosive Transfer Device	**(when present)**	**(when present)**
#/gun	1	2
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0040
Total Gun NEW (kg)	0.0042	3.2977

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Gun body**	
B	**Perforator**	
C	**Detonating Cord**	
D	**Explosive Transfer Device (explosive)** **or Detcord End Seal (non-explosive)**	**Optional** **Optional**
E	**Alignment Plug & Sleeve**	
F	**Lead Wire**	**Optional**

Notes:

1. Components B - D (explosive transfer device) must be DOT approved.
   See Section 5.1.2 of Perforating Gun Approval Guide for verification requiremements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Where Special Provision 114 of 49 CFR 172.103 applies, this perforating gun system may be classed, marked, labeled, described, and transported as UN0494 (1.4D).

4. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

5. Components A - D (explosive transfer device) must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

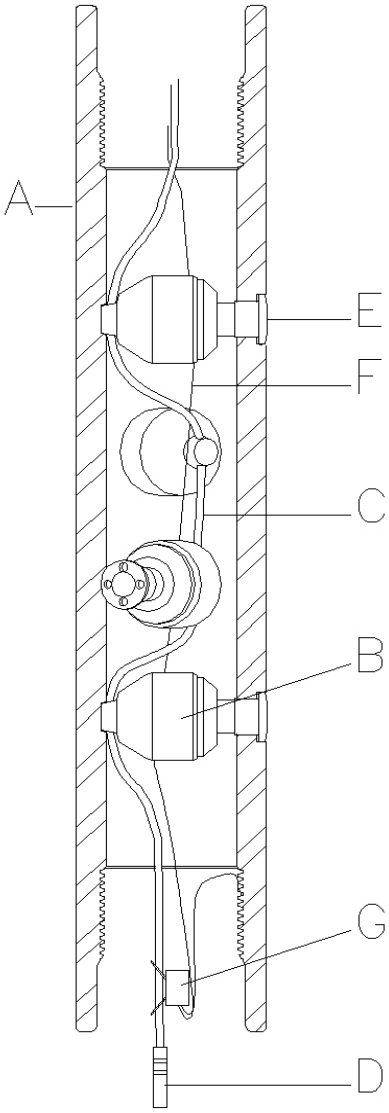
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: UN0124 (See also Note 3)
Description: JET PERFORATING GUNS, CHARGED
oil well, without detonator
Label: 1.1D (See also Note 3)

Perforating Gun Specification

Ported Tube System (with Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	0.5	21
Diameter (in)	2.500	6
Perforators		
#/gun	1	81
Device NEW (g)	2	39
Perforating gun NEW (kg)	0.0020	3.1590
Detonating Cord		
ft/gun	0.5	26
Device NEW (g/ft)	3.89	5.18
Perforating gun NEW (kg)	0.0019	0.1347
Explosive Transfer Device	**(when present)**	**(when present)**
#/gun	1	2
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0040
Detonator		
#/gun	1	1
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0020
Total Gun NEW (kg)	0.0045	3.2997

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Gun body**	
B	**Perforator**	
C	**Detonating Cord**	
D	**Explosive Transfer Device (explosive)** **or Detcord End Seal (non-explosive)**	**Optional** **Optional**
E	**Alignment Plug & Sleeve**	
F	**Lead Wire**	**Optional**
G	**Detonator**	**See note 4**

Notes:

1. Components B - D (explosive transfer device) & G must be DOT approved.
   See Section 5.1.2 of Perforating Gun Approval Guide for verification requiremements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

4. A means to interrupt and prevent detonation of the detonator from initiating the detonating cord must be installed between each electric detonator and the detonating cord ends of the perforating guns before the they are offered for transportation and while they are being transported

5. Components A - D (explosive transfer device) and G must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

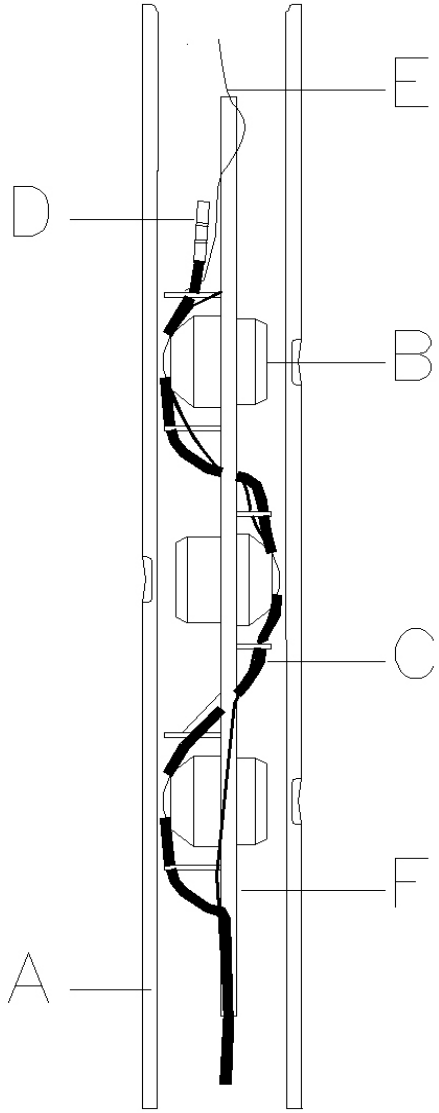
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: NA0494 or NA0124
Description: JET PERFORATING GUNS, CHARGED OIL WELL, WITH DETONATOR
Label: 1.4D (NA0494) or 1.1D (NA0124)

Perforating Gun Specification

Tube & Strip System (w/o Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	1	31
Diameter (in)	1.375	5
Perforators		
#/gun	1	180
Device NEW (g)	1.5	32
Perforating gun NEW (kg)	0.0015	5.7600
Detonating Cord		
ft/gun	1	35
Device NEW (g/ft)	1.62	5.18
Perforating gun NEW (kg)	0.0016	0.1813
Explosive Transfer Devices	**(when present)**	**(when present)**
#/gun	1	2
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0040
Total Gun NEW (kg)	0.0034	5.9453

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Gun body**	
B	**Perforator**	
C	**Detonating Cord**	
D	**Explosive Transfer Device (explosive)** **or Detcord End Seal (non-explosive)**	**Optional** **Optional**
E	**Lead Wire**	**Optional**
F	**Carrier Strip**	**Flat or Spiral**

Notes:

1. Components B - D (explosive transfer device) must be DOT approved.
   See Section 5.1.2 of Perforating Gun Approval Guide for verification requiremements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Where Special Provision 114 of 49 CFR 172.103 applies, this perforating gun system may be classed, marked, labeled, described, and transported as UN0494 (1.4D).

4. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

5. Components A - D (explosive transfer device) must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

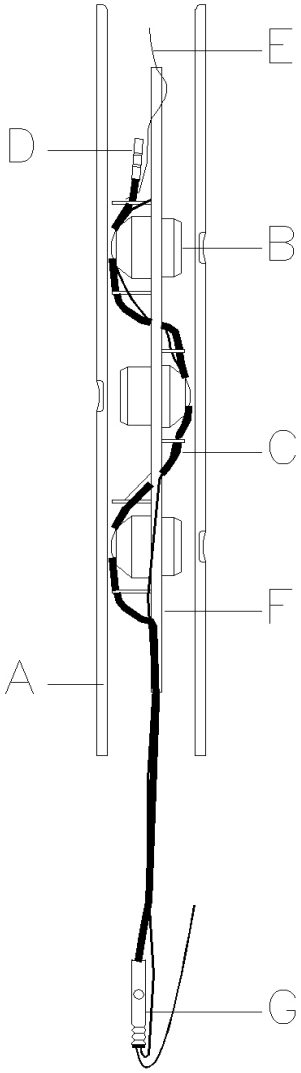
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: UN0124 (See also Note 3)
Description: JET PERFORATING GUNS, CHARGED
oil well, without detonator
Label: 1.1D (See also Note 3)

Perforating Gun Specification

Tube & Strip System (with Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	1	31
Diameter (in)	1.375	5
Perforators		
#/gun	1	180
Device NEW (g)	1.5	32
Perforating gun NEW (kg)	0.0015	5.7600
Detonating Cord		
ft/gun	1	35
Device NEW (g/ft)	1.62	5.18
Perforating gun NEW (kg)	0.0016	0.1813
Bi-directional Boosters	**(when present)**	**(when present)**
#/gun	1	2
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0040
Detonator		
#/gun	1	1
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0020
Total Gun NEW (kg)	0.0037	5.9473

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Gun body**	
B	**Perforator**	
C	**Detonating Cord**	
D	**Explosive Transfer Device (explosive)** **or Detcord End Seal (non-explosive)**	**Optional** **Optional**
E	**Lead Wire**	**Optional**
F	**Carrier Strip**	**Flat or Spiral**
G	**Detonator**	**See note 4**

Notes:

1. Components B - D (explosive transfer device) & G must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requiremements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

4. A means to interrupt and prevent detonation of the detonator from initiating the detonating cord must be installed between each electric detonator and the detonating cord ends of the perforating guns before the they are offered for transportation and while they are being transported

5. Components A - D (explosive transfer device) and F - G must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

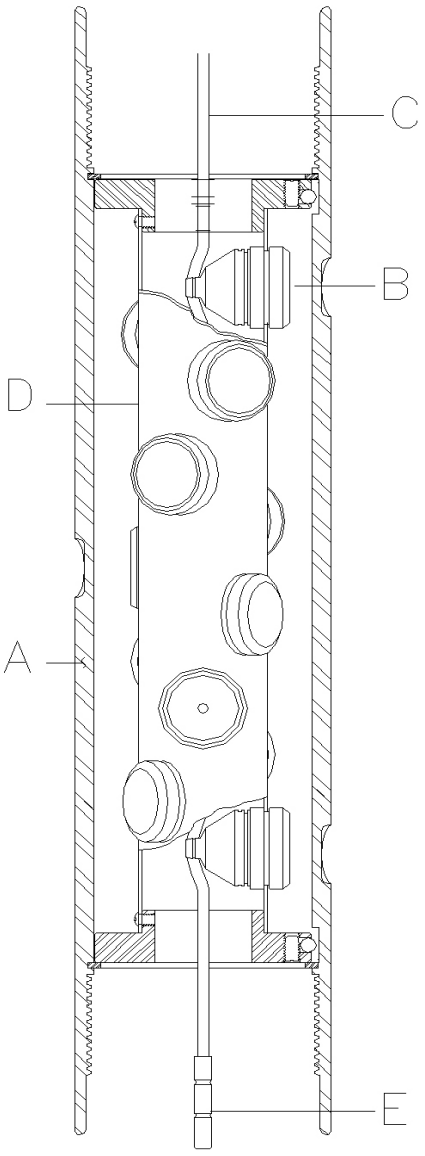
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: NA0494 or NA0124
Description: JET PERFORATING GUNS, CHARGED OIL WELL, WITH DETONATOR
Label: 1.4D (NA0494) or 1.1D (NA0124)

Perforating Gun Specification

Tube & Tube System (w/o Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	0.75	31
Diameter (in)	1.375	10
Perforators		
#/gun	1	744
Device NEW (g)	1.5	61
Perforating gun NEW (kg)	0.0015	45.3840
Detonating Cord		
ft/gun	1	35
Device NEW (g/ft)	1.62	5.18
Perforating gun NEW (kg)	0.0016	0.1813
Explosive Transfer Devices	**(when present)**	**(when present)**
#/gun	1	8
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0160
Total Gun NEW (kg)	0.0034	45.5813

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Gun body**	
B	**Perforator**	
C	**Detonating Cord**	
D	**Carrier Tube**	
E	**Explosive Transfer Device (explosive)** **or Detcord End Seal (non-explosive)**	**Optional** **Optional**
F	**Lead Wire**	**Optional** **(not shown)**

Notes:

1. Components B - C & E (explosive transfer device) must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requiremements.
2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.
3. Where Special Provision 114 of 49 CFR 172.103 applies, this perforating gun system may be classed, marked, labeled, described, and transported as UN0494 (1.4D).
4. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.
5. Components A - E (explosive transfer device) must be manufactured, imported, or distributed by an AESC or IME member company.
6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

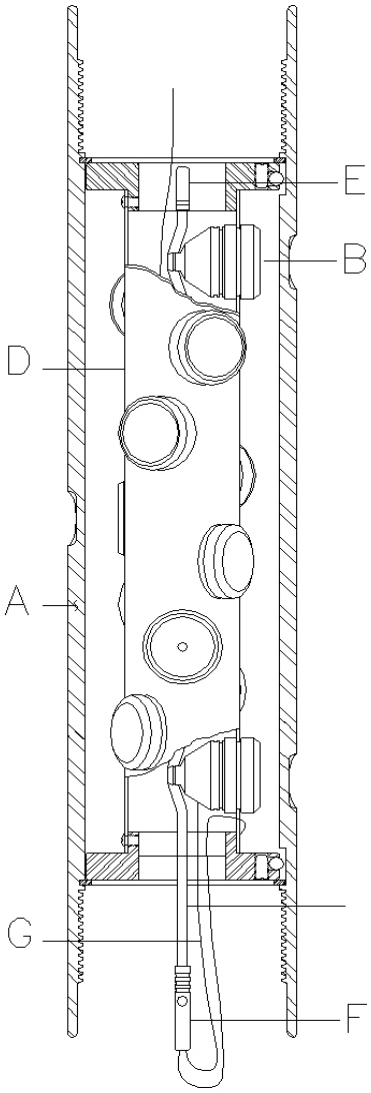
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: UN0124 (See also Note 3)
Description: JET PERFORATING GUNS, CHARGED
oil well, without detonator
Label: 1.1D (See also Note 3)

Perforating Gun Specification

Tube & Tube System (with Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	0.75	31
Diameter (in)	1.375	10
Perforators		
#/gun	1	744
Device NEW (g)	1.5	61
Perforating gun NEW (kg)	0.0015	45.3840
Detonating Cord		
ft/gun	1	35
Device NEW (g/ft)	1.62	5.18
Perforating gun NEW (kg)	0.0016	0.1813
Explosive Transfer Devices	**(when present)**	**(when present)**
#/gun	1	8
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0160
Detonator		
#/gun	1	1
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0020
Total Gun NEW (kg)	0.0037	45.5833

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Gun body**	
B	**Perforator**	
C	**Detonating Cord**	
D	**Carrier Tube**	
E	**Explosive Transfer Device (explosive)** **or Detcord End Seal (non-explosive)**	**Optional** **Optional**
F	**Detonator**	**See note 4**
G	**Lead Wire**	**Optional**

Notes:

1. Components B - C, E (explosive transfer device) & F must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requiremements.
2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.
3. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.
4. A means to interrupt and prevent detonation of the detonator from initiating the detonating cord must be installed between each electric detonator and the detonating cord ends of the perforating guns before the they are offered for transportation and while they are being transported
5. Components A - E (explosive transfer device) and F must be manufactured, imported, or distributed by an AESC or IME member company.
6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

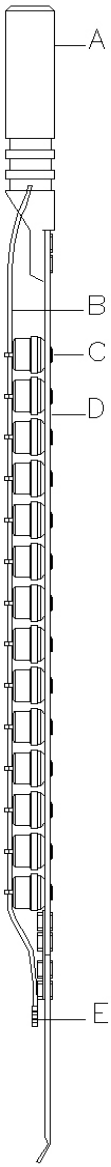
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: NA0494 or NA0124
Description: JET PERFORATING GUNS, CHARGED OIL WELL, WITH DETONATOR
Label: 1.4D (NA0494) or 1.1D (NA0124)

Perforating Gun Specification

Strip Carrier System (w/o Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	1	24
Diameter (in)	1.375	3.5
Perforators		
#/gun	1	144
Device NEW (g)	2	39
Perforating gun NEW (kg)	0.0020	5.6160
Detonating Cord		
ft/gun	1	28
Device NEW (g/ft)	2.59	5.18
Perforating gun NEW (kg)	0.0026	0.1450
Explosive Transfer Devices	**(when present)**	**(when present)**
#/gun	1	2
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0040
Total Gun NEW (kg)	0.0049	5.7650

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Adapter**	**Optional**
B	**Detonating Cord**	
C	**Perforator**	
D	**Carrier Strip**	Flat, Twisted, or Zig-Zag
E	**Explosive Transfer Device (explosive)** **or Detcord End Seal (non-explosive)**	**Optional** **Optional**
F	**Lead Wire**	**Optional** **(not shown)**

Notes:

1. Components B - C & E (explosive transfer device) must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requiremements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Where Special Provision 114 of 49 CFR 172.103 applies, this perforating gun system may be classed, marked, labeled, described, and transported as UN0494 (1.4D).

4. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

5. Components A - E (explosive transfer device) must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

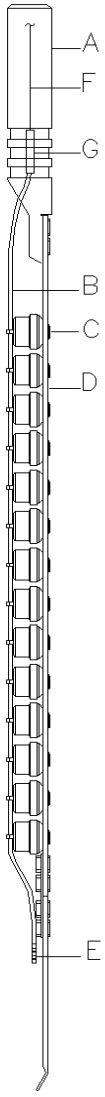
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: UN0124 (See also Note 3)
Description: JET PERFORATING GUNS, CHARGED
oil well, without detonator
Label: 1.1D (See also Note 3)

Perforating Gun Specification

Strip Carrier System (with Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	1	24
Diameter (in)	1.375	3.5
Perforators		
#/gun	1	144
Device NEW (g)	2	39
Perforating gun NEW (kg)	0.0020	5.6160
Detonating Cord		
ft/gun	1	28
Device NEW (g/ft)	2.59	5.18
Perforating gun NEW (kg)	0.0026	0.1450
Explosive Transfer Devices	**(when present)**	**(when present)**
#/gun	1	2
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0040
Detonator		
#/gun	1	1
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0020
Total Gun NEW (kg)	0.0052	5.7670

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Adapter**	**Optional**
B	**Detonating Cord**	
C	**Perforator**	
D	**Carrier Strip**	Flat, Twisted, or Zig-Zag
E	**Explosive Transfer Device (explosive)** **or Detcord End Seal (non-explosive)**	**Optional** **Optional**
F	**Lead Wire**	**Optional**
G	**Detonator**	**See note 4**

Notes:

1. Components B - C, E (explosive transfer device) & G must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requiremements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

4. A means to interrupt and prevent detonation of the detonator from initiating the detonating cord must be installed between each electric detonator and the detonating cord ends of the perforating guns before the they are offered for transportation and while they are being transported

5. Components A - E (explosive transfer device) and G must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

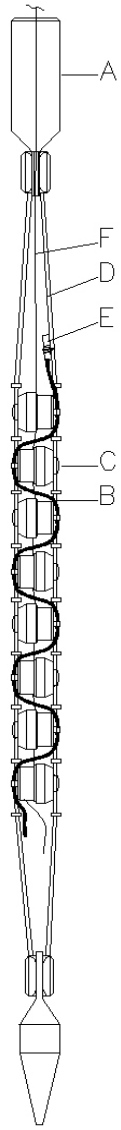
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: NA0494 or NA0124
Description: JET PERFORATING GUNS, CHARGED OIL WELL, WITH DETONATOR
Label: 1.4D (NA0494) or 1.1D (NA0124)

Perforating Gun Specification

Wire Carrier System (w/o Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	3	70
Diameter (in)	1.000	2.125
Perforators		
#/gun	1	150
Device NEW (g)	0.5	39
Perforating gun NEW (kg)	0.0005	5.8500
Detonating Cord		
ft/gun	1	72
Device NEW (g/ft)	2.59	5.18
Perforating gun NEW (kg)	0.0026	0.3730
Total Gun NEW (kg)	0.0031	6.2230

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Adapter**	**Optional**
B	**Detonating Cord**	
C	**Perforator**	
D	**Carrier Wire**	**Two or more**
E	**Detcord End Seal (non-explosive)**	**Optional**
F	**Lead Wire**	**Optional**

Notes:

1. Components B - C must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requirements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Where Special Provision 114 of 49 CFR 172.103 applies, this perforating gun system may be classed, marked, labeled, described, and transported as UN0494 (1.4D).

4. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

5. Components A - D must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

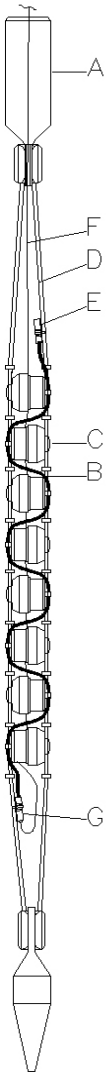
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: UN0124 (See also Note 3)
Description: JET PERFORATING GUNS, CHARGED
oil well, without detonator
Label: 1.1D (See also Note 3)

Perforating Gun Specification

Wire Carrier System (with Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	3	70
Diameter (in)	1.000	2.125
Perforators		
#/gun	1	150
Device NEW (g)	0.5	39
Perforating gun NEW (kg)	0.0005	5.8500
Detonating Cord		
ft/gun	1	72
Device NEW (g/ft)	2.59	5.18
Perforating gun NEW (kg)	0.0026	0.3730
Detonator		
#/gun	1	1
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0020
Total Gun NEW (kg)	0.0034	6.2250

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Adapter**	**Optional**
B	**Detonating Cord**	
C	**Perforator**	
D	**Carrier Wire**	**Two or more**
E	**Detcord End Seal (non-explosive)**	**Optional**
F	**Lead Wire**	**Optional**
G	**Detonator**	**See note 4**

Notes:

1. Components B - C & G must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requiremements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

4. A means to interrupt and prevent detonation of the detonator from initiating the detonating cord must be installed between each electric detonator and the detonating cord ends of the perforating guns before the they are offered for transportation and while they are being transported

5. Components A - D and G must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

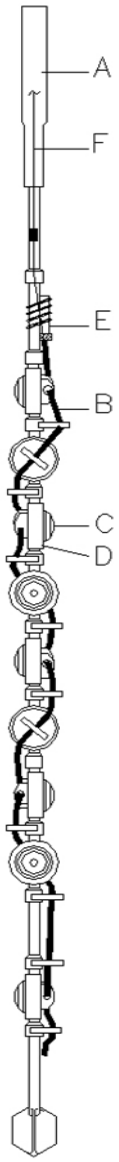
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: NA0494 or NA0124
Description: JET PERFORATING GUNS, CHARGED OIL WELL, WITH DETONATOR
Label: 1.4D (NA0494) or 1.1D (NA0124)

Perforating Gun Specification

Link Carrier System (w/o Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	1	30
Diameter (in)	1.250	2.5
Perforators		
#/gun	1	180
Device NEW (g)	2	39
Perforating gun NEW (kg)	0.0020	7.0200
Detonating Cord		
ft/gun	1	34
Device NEW (g/ft)	5.18	5.18
Perforating gun NEW (kg)	0.0052	0.1761
Total Gun NEW (kg)	0.0072	7.1961

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	Adapter	Optional
B	Detonating Cord	
C	Perforator	
D	Charge Holder	Two or more
E	Detcord End Seal (non-explosive)	Optional
F	Lead Wire	Optional

Notes:

1. Components B - C must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requirements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Where Special Provision 114 of 49 CFR 172.103 applies, this perforating gun system may be classed, marked, labeled, described, and transported as UN0494 (1.4D).

4. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

5. Components A - D must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

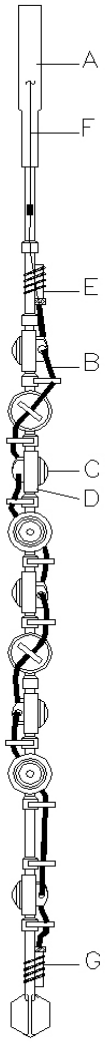
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: UN0124 (See also Note 3)
Description: JET PERFORATING GUNS, CHARGED
oil well, without detonator
Label: 1.1D (See also Note 3)

Perforating Gun Specification

Link Carrier System (with Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	1	30
Diameter (in)	1.250	2.5
Perforators		
#/gun	1	180
Device NEW (g)	2	39
Perforating gun NEW (kg)	0.0020	7.0200
Detonating Cord		
ft/gun	1	34
Device NEW (g/ft)	5.18	5.18
Perforating gun NEW (kg)	0.0052	0.1761
Detonator		
#/gun	1	1
Device NEW (g)	0.3	2
Perforating gun NEW (kg)	0.0003	0.0020
Total Gun NEW (kg)	0.0075	7.1981

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	**Adapter**	**Optional**
B	**Detonating Cord**	
C	**Perforator**	
D	**Charge Holder**	**Two or more**
E	**Detcord End Seal (non-explosive)**	**Optional**
F	**Lead Wire**	**Optional**
G	**Detonator**	**See note 4**

Notes:

1. Components B - C & G must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requirements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

4. A means to interrupt and prevent detonation of the detonator from initiating the detonating cord must be installed between each electric detonator and the detonating cord ends of the perforating guns before the they are offered for transportation and while they are being transported

5. Components A - D and G must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

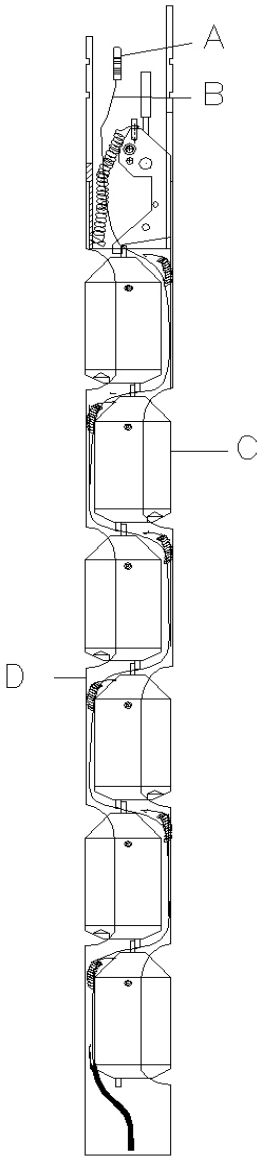
Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: NA0494 or NA0124
Description: JET PERFORATING GUNS, CHARGED OIL WELL, WITH DETONATOR
Label: 1.4D (NA0494) or 1.1D (NA0124)

Perforating Gun Specification

Swing Carrier System (w/o Detonator)

Version: 01



Gun System Details

	Min	Max
Size		
Length (ft)	1	15
Diameter (in)	1.375	2.125
Perforators		
#/gun	1	61
Device NEW (g)	11	36
Perforating gun NEW (kg)	0.0110	2.1960
Detonating Cord		
ft/gun	1.8	25
Device NEW (g/ft)	2.59	3.89
Perforating gun NEW (kg)	0.0047	0.0973
Total Gun NEW (kg)	0.0157	2.2933

NEW = net explosive weight

Gun System Components

Label	Component	Comments
A	Detcord End Seal (non-explosive)	Optional
B	Detonating Cord	
C	Perforator	
D	Carrier	

Notes:

1. Components B - C must be DOT approved. See Section 5.1.2 of Perforating Gun Approval Guide for verification requirements.

2. Drawing is a typical representation depicting major components of the specified perforating gun system. Actual details may vary. Additional, non-explosive components may be present (for example: bull plugs, tandem subs, and/or alignment mechanisms). Drawing depicts a single gun. One or more guns may be connected together in tandem during transport.

3. Where Special Provision 114 of 49 CFR 172.103 applies, this perforating gun system may be classed, marked, labeled, described, and transported as UN0494 (1.4D).

4. Compliance with Packing Instruction US1 of 49 CFR 173.62 is required.

5. Components B - D must be manufactured, imported, or distributed by an AESC or IME member company.

6. Perforating guns are to be marked and labeled in accordance with 49 CFR, Part 172 prior to transport.

Dangerous Goods Information (as assigned by DOT):

EX-Number: As assigned by DOT
UN No: UN0124 (See also Note 3)
Description: JET PERFORATING GUNS, CHARGED
oil well, without detonator
Label: 1.1D (See also Note 3)

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Guide to Obtaining DOT Approval of Jet Perforating Guns using AESC/IME Perforating Gun Specifications

Annex 2

Text of Special Provision 114 of 49 CFR 172.102

114 Jet perforating guns, charged, oil well, without detonator may be reclassed to Division 1.4 Compatibility Group D (1.4D) if the following conditions are met:

a. The total weight of the explosive contents of the shaped charges assembled in the guns does not exceed 90.5 kg (200 pounds) per vehicle; and

b. The guns are packaged in accordance with Packing Method US 1 as specified in §173.62 of this subchapter.

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Guide to Obtaining DOT Approval of Jet Perforating Guns using AESC/IME Perforating Gun Specifications

Annex 3
Text of Packing Method US 1 of 49 CFR 173.62

1. A jet perforating gun, charged, oil well may be transported under the following conditions:

   a. Initiation devices carried on the same motor vehicle or offshore supply vessel must be segregated; each kind from every other kind, and from any gun, tool or other supplies, unless approved in accordance with §173.56. Segregated initiation devices must be carried in a container having individual pockets for each such device or in a fully enclosed steel container lined with a non-sparking material. No more than two segregated initiation devices per gun may be carried on the same motor vehicle.

   b. Each shaped charge affixed to the gun may not contain more than 112 g (4 ounces) of explosives.

   c. Each shaped charge if not completely enclosed in glass or metal, must be fully protected by a metal cover after installation in the gun.

   d. A jet perforating gun classed as 1.1D or 1.4D may be transported by highway by private or contract carriers engaged in oil well operations.

      (i) A motor vehicle transporting a gun must have specially built racks or carrying cases designed and constructed so that the gun is securely held in place during transportation and is not subject to damage by contact, one to the other or any other article or material carried in the vehicle; and

      (ii) The assembled gun packed on the vehicle may not extend beyond the body of the motor vehicle.

   e. A jet perforating gun classed as 1.4D may be transported by a private offshore supply vessel only when the gun is carried in a motor vehicle as specified in paragraph (d) of this packing method or on offshore well tool pallets provided that:

      (i) All the conditions specified in paragraphs (a), (b), and (c) of this packing method are met;

      (ii) The total explosive contents do not exceed 90.8 kg (200 pounds) per tool pallet;

      (iii) Each cargo vessel compartment may contain up to 90.8 kg (200 pounds) of explosive content if the segregation requirements in §176.83(b) of this subchapter are met; and

      (iv) When more than one vehicle or tool pallet is stowed “on deck” a minimum horizontal separation of 3 m (9.8 feet) must be provided.

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Guide to Obtaining DOT Approval of Jet Perforating Guns using AESC/IME Perforating Gun Specifications

Annex 4

Example Application Format

(see next page)

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Date
Optional document ID

Associate Administrator for Hazardous Materials Safety
Pipeline and Hazardous Materials Safety Administration
U.S. Department of Transportation
Office of Approvals and Special Permits, PHH-32
East Building
1200 New Jersey Avenue, SE
Washington, DC 20590-0001

Subject: Approval Application – Perforating Gun System using AESC/IME Perforating Gun Specification

Dear Associate Administrator:

Application for an explosives approval as described below is submitted. In compliance with 49 CFR 107.705, the following information is provided:

A. Section under which application is made

49 CFR §173.51(a), §173.56(b)(1), and §173.58

B. Approval, registration, or exemption number

EX-number to be assigned.

C. Name, address, and telephone number of the applicant

Applicant Name:	
Applicant Mailing Address:	
Contact Name:	
Contact Phone Number:	
Contact Fax Number:	
Contact E-mail Address:	

D. Product Identification

The product to be approved is described as (check only one entry and, if "Other" checked, fill in blank):

☐ Please use Applicant Name (Section C) + System Name + Division (Section D)
☐ Other (please specify): _____

E. System to be Approved and Classification Sought

Approval of the following AESC/IME Perforating Gun Specification Gun System (check only one entry):

Systems without Detonators	Systems with Detonators
☐ Ported tube systems ☐ Tube & strip systems ☐ Tube & tube systems ☐ Strip carrier systems ☐ Wire carrier systems ☐ Link carrier systems ☐ Swing carrier systems	☐ Ported tube systems ☐ Tube & strip systems ☐ Tube & tube systems ☐ Strip carrier systems ☐ Wire carrier systems ☐ Link carrier systems

Classification sought (check only one entry):

Systems without Detonators Jet Perforating Guns, Charged	Systems with Detonators Jet Perforating Guns, Charged Oil Well, with Detonator
☐ UN0124, 1.1D ☐ UN0494, 1.4D	☐ NA0124, 1.1D ☐ NA0494, 1.4D

F. Proposed duration of approval

Consistent with current DOT policy.

G. Transport mode(s) affected

Check all that apply:

☐ Highway (UN0124, UN0494, NA0124, NA0494)
☐ Cargo-only Air (UN0494)
☐ Cargo-only Rail (UN0124, UN0494)
☐ Vessel (UN0124, UN0494, NA0124, NA0494)

H. Certification

By my signature below, I certify the following facts:

1. I possess the appropriate ATF license or permit required to engage in explosives operations. A copy of that license or permit is attached; if expired, a copy of the ATF Letter of Authorization is also attached.

2. I have reviewed the AESC/IME Perforating Gun Specification indicated in Section D above and confirm that my perforating gun system meets the graphical representation, the technical specifications, and compliance requirements contained thereon.

Sincerely,

Name
Title

Attachments: ATF license or permit
AESC/IME Perforating Gun Specification