NATO STANDARD

AFLP-3149

MINIMUM QUALITY SURVEILLANCE FOR FUELS

Edition A, Version 1

JUNE 2023

NORTH ATLANTIC TREATY ORGANIZATION

ALLIED FUELS AND LUBRICANTS PUBLICATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

21 June 2023

1. The enclosed Allied Fuels and Lubricants Publication AFLP-3149, Edition A, Version 1, MINIMUM QUALITY SURVEILLANCE FOR FUELS, which has been approved by the nations in the PETROLEUM COMMITTEE, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 3149.

2. AFLP-3149, Edition A, Version 1, is effective upon receipt.

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4. This publication shall be handled in accordance with C-M(2002)60.

Dimitrios SIGOULAKIS
Lieutenant General, GRC (A)
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
Note: The reservations listed on this page include only those that were recorded at time of promulgation and may not be complete. Refer to the NATO Standardization Document Database for the complete list of existing reservations.	

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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
BGR	Due to the lack of appropriate equipment the Bulgarian Armed Forces will not implement the requirements of AFLP-3149 related to B-2 TESTS as follows: 1. From Table 2-5 – Vapour Pressure, Water Reaction, Oxidation Stability. 2. From Table 2-6 (Concluded on page 2-7) – Thermal Stability, Vapour Pressure, Fuel System Icing Inhibitor. 3. From Table 2-8 – Vapour Pressure, Oxidation stability. 4. From Table 2-9 - Vapour Pressure, Water Reaction or Demulsibility.
CAN	1. Table 2-4, Canada has very limited flash point testing capability at the Unit level. The flash point requirement is not met by into-plane contracts and Canadian industry practice. 2. Table 2-6, Canada does not meet the FAME testing requirement. The CAN/CGSB standards do not include the olefin testing requirement for F-40 and F-44 fuel. 3. Paragraph 0606.a to d, Canada may sample and test one in forty containers per batch per remote northern location every 24 months. 4. Canada does not have on board capability for flash point and density testing when fuel is transferred from supply fuel terminal to a military warship or supply ship
DEU	Page 2-4, table 2-4: The new requirement for flash point determination for F-24, F-27, F-34, F-35 and F-37 is not necessary in the DEU point of view in case of C+ test. DEU will not implement this.
FRA	1. The frequency of type B2 analyses. This reservation had already been made for previous editions. In France, the frequency of such tests is as follows: F-18: six months; F-34, F-35 and F-44: 18 months; reduced to 12 months at low latitudes; F-54, F-58, F-67 and F-76: 14 months. 2. Type B2 analyses on new bladders when commissioned; 3. Systematic bio-contamination testing as part of type B2 analyses; 4. Flash point testing in type C+ analyses for F-44 and F-76. This test is performed by France only if the vessel or the oil infrastructure is fitted with the appropriate equipment;

	5. The minimum standard of filtration (25 micron-filter) for ground use fuels.
GRC	HAF: 1. Lacking equipment on "C+" field testing, HAF will perform a type "C" test instead of "C+" in the following points: a. Table 4-1, pg 4-7, under column "Departure (After Loading)" b. Table 4-1, pg 4-8, under column "Arrival (Before Unloading)" c. Table 4-3, pg 4-14, under column "Departure (After Loading)" 2. Concerning Table 2-6, pg 2-6, HAF fuel laboratories do not perform FAME analysis, since there is no circulation of different type of fuels inside the GRPS.
USA	The USAF takes the following reservations to: Section 8 - (1) For replacement of filter element, the standard of 20 psi is established for all elements except the final filtration where the NATO standard of 15 psi is used. (2) For expeditionary refueling utilizing Fuels Operational Readiness Capability Equipment (FORCE), a filter water separator IAW EI 1581 is not required, instead a fuel filter cartridge is used. Section 7 - T.O.37A,-1-101, USAF Fuel, Water, and Lubricant Dispensing Equipment, directs storage and shelf life of hoses based on National Stock Number (NSN) and has no service life requirement as found in AFLP-3149 EDA V1 RD1, 0706.b.
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SECTION 1 MINIMUM COMMON REQUIREMENTS

0101. **General.**

a. Training of Personnel. All personnel required for the handling of fuels are to be suitably trained to ensure that they are fully competent to perform their duties.

b. Specifications. The national specifications given at Section 4 to AFLP 1135 set out the quality requirements of any product upon procurement.

c. Qualification Testing. Before a nation accepts any product on which qualification testing is required it is necessary for that nation to ensure that the qualification tests are performed, officially or under official supervision. In the case of imported products, each nation is to ensure that the product has received qualification (see paragraph 0101.d.). The general characteristics obtained during qualification shall be available, on request, for subsequent identification of the product so that results obtained during quality control may be compared with them.

d. Procurement or Source Inspection. An officially designated laboratory capable of carrying out full specification testing of fuels by the approved methods, is to be located in, or available to, each NATO nation. Products shall not be accepted unless approved by the cognisant national inspecting authority in accordance with that nations regulations (AQAP 2131 will aid in this process). Further details on testing laboratories and capabilities can be found at Section 9. Contractors supplying fuels shall, as a minimum requirement, meet ISO 9001 or AQAP 2120. Nations having contracts for fuels outside their own country, will be responsible for the provision of adequate procurement inspection, either by themselves or by a cross-servicing agreement with the national inspecting authority of the country in which the procurement is made.

e. Conditions of Use of NATO Markings. The use, within any NATO nation, of the NATO marking system for identification of fuels, is to be conditional, not only upon observance of STANAG 1135/AFLP-1135 for the products themselves, but also upon the full application by that nation of the minimum quality surveillance measures in this STANAG.

f. If a fuel becomes off-specification with respect to the NATO allowable deterioration limits given in STANAG 1110/AFLP-1110 before use, a line of colour contrasting with the NATO Marking and the background colour of the container, is to be drawn diagonally across and beyond the rectangle enclosing the NATO code number. The thickness of the line will be such that it is clearly visible and the NATO marking easily read. The NATO marking is then to be considered cancelled and the product may if desired, be considered as an emergency substitute for the original product and thus may only be used under technical advice.

g. Packaging, Marking and Identification. Distribution of fuels shall be made only from batches that have passed the necessary inspection tests (see Sections 2 and 4). All bulk and packaged products that are not in reusable containers (e.g. jerricans etc.) shall be identifiable and records are to be available enabling the origin, location and history of fuels to be traced at any time. Details of the minimum marking requirements for packaged fuels are given in Section 6, paragraphs 0606-0609.

0102. **Single Fuel Policy.** The single fuel policy requires that F-34 fuel is available for NATO

operations. The supply and distribution of F-34 shall be to aviation fuel quality standards up to the point of consumption. Aviation fuel quality procedures specified throughout this AFLP shall apply to field and out-of-area deployments, where applicable. When additional performance additives, for example, S-1750, are added for use by ground systems, the fuel shall no longer be designated as F-34 and is therefore prohibited for aircraft use. This fuel shall be designated F-63.

0103. **STANAG Structure.**

a. The purpose of this AFLP is to provide a set of agreed guidelines, to be used as a minimum by participating nations in the handling and quality assurance of bulk and packed fuels. The AFLP itself is broken down into informative Sections that will aid in this process. Sections 1-5 are of a procedural nature whereas Sections 6-10 provide supporting information.

b. Operations are currently often multinational operations resulting in a sometimes complex Fuel Supply Chain. It is necessary to make Roles and Responsibilities clear during Bulk Fuel Supply activities. Section 1 describes where the roles of Military Authority and Technical Fuel Expert in the Fuel Supply Chain are designated.

c. Section 2 gives an explanation on the different test regimes, from extensive testing at the source of the product to limited testing further in the Fuel Supply Chain. Section 2 also contains a number of tables with chemical and physical parameters to be tested for all types of NATO-coded fuels under several regimes.

d. Proper sampling is a prerequisite for whatsoever analysis is to be conducted. Details on the correct sampling of bulk fuels are described in Section 3.

e. The procedures for Quality Control in the Fuel Supply Chain are described in Section 4 of this AFLP. Section 4 contains a number of flowcharts for different situations in the Fuel Supply Chain for Aviation, Ground and Marine fuels. In these flowcharts the quality control measures can be found which have to be taken for the described situation.

f. Operations and exercises can occur under non-ideal, so called compromised circumstances, in which the standard quality control procedure cannot be fully met. Section 5 gives guidelines how to operate under such circumstances.

g. Although Bulk Fuels are the main part of the Fuel Supply Chain there are fuels supplied in Packed Containers. Fuels in Packed Containers require a different approach with respect to handling and sampling. This is described in Section 6.

h. As cleanliness is essential in the Fuel Supply Chain, it is described in Section 7 and outlines precautions that have to be taken in cases of change of grade in whatsoever part of the Fuel Supply Chain. Cleanliness is also achieved by proper filtration procedures. These are described in Section 8.

i. Also for laboratories there are a number of requirements. These are in general described in Section 9. However, refer also to STANAG 4605, Appendix 14/module 4 “deployable quality assurance equipment”.

j. Section 10 gives supporting information with respect to definitions and terminology applicable to and essential for the Fuel Supply Chain both civilian and Military.

Section	Title	Explanation
1	Minimum Common Requirements	Operations are currently often multinational resulting in a sometimes complex Fuel Supply Chain. It is therefore necessary to ensure that Roles and Responsibilities are clearly defined.
2	Minimum Testing Requirements	Provides an explanation on the different test regimes that shall be applied at various stages throughout the Fuel supply Chain. This Section also contains a number of tables with chemical and physical parameters to be tested for all types of NATO-coded fuels in the several test regimes.
3	Sampling	Provides guidance on how to sample correctly. Analysis of any sample is fully dependent on the way in which it has been sampled. Correct sampling can help prevent delays in releasing fuel for use rather than having to repeat the process to perform confirmationary testing.
4	Quality Control in Routine Circumstances, Including Flowcharts for Aviation Fuels, Ground Fuels and Marine Fuels	The procedures for Quality Control in the Fuel Supply Chain are described in Section 4 of this AFLP. Section 4 contains a number of flowcharts for different situations in the Fuel Supply Chain for Aviation, Ground and Marine fuels.
5	Quality Control Procedures in Compromised Circumstances	Operations and exercises can and do occur under non-ideal conditions. These so called compromised circumstances, in which it is not possible to apply standard quality control procedures are dealt with here.
6	Handling and Sampling of Fuels in Packed Containers	In addition to bulk fuel supplies the Fuel Supply Chain may be supplemented through the use fuels supplied in containers such as drums and or jerricans. When supplied in such containers a slightly different approach is required in assuring that quality is maintained.
7	Cleanliness Requirements	Cleanliness is essential throughout the Fuel Supply Chain. Failure to meet the requirements in this Section may have a serious impact on fuel quality.
8	Filtration	An important feature in maintaining fuel cleanliness is that of correct filtration which is described here.
9	Testing Laboratories and Testing Capability	General requirements for a laboratory are described in conjunction with STANAG 4616. In addition also refer to STANAG 4605, Appendix 14/module 4 “deployable quality assurance equipment”.
10	Glossary	Provides supporting information with respect to definitions and terminology applicable to and essential for the Fuel Supply Chain both civilian and Military.

Table 1-1

0104. **Roles and Responsibilities.**

a. With the exception of Compromised Circumstances (see Section 5) all NATO Fuel Supply Chain (FSC) must provide fuel to the end user that has been subject to the minimum acceptable quality surveillance procedures detailed in this document. This fundamental principle applies equally to daily fuelling activities at the home base or during expeditionary operations and exercises. It is essential the end user understands the characteristics/properties and quality of the fuel being delivered in order to assess the impact of any potential adverse effect on equipment.

b. For home based activities, it is a national responsibility to ensure that fuel supply to its own forces is meeting minimum national quality standards. Fuel supply to forces of other NATO nations must comply with the minimum NATO quality standards as outlined in this document.

c. The quality aspects of the FSC supporting NATO operations and exercises are the responsibility of the NATO Command responsible for the operation/exercise. To that extent, the NATO Command will have to rely on Technical Fuel Expert (TFE) from participating nations or other NATO bodies. Therefore, proper consideration will be given to it during the Logistics Operational Planning Process and when establishing a Fuels Supply Plan.

d. In case multi-national solutions (i.e. Logistics Role Specialist Nation or NATO BOA (Basic Ordering Agreement) Contract) for fuel supply in support of NATO operations/exercises, the appropriate TFE would be provided by one of the participating nations.

e. When transferring authority of the FSC to commercial contractor support or Troop Contributing Nations, appropriate consideration will be given to TFE availability.

SECTION 2 MINIMUM TESTING REQUIREMENTS (INCLUDING FUELS HANDLED IN THE NATO PIPELINE SYSTEMS)

0201. **General**.

a. The type of test which has to be performed as a minimum at a specific point within the Fuel Supply Chain (FSC) is described in Section 4.

b. The tests and their significances are described in Table 2-1.

c. The test methods for the various tests to be performed are prescribed in the relevant specifications and/or STANAGS**.**

c.1. For tests performed in case of fuel transfers, STANAG 7036, also applies for fuels to be introduced into and delivered by the NATO pipeline systems, also applies.

c.2. For the B2 tests that are performed for the check of deterioration during storage, test result limits are given in STANAG 1110, Allowable deterioration limits for NATO armed forces fuels, lubricants and associated products.

c.3. In cases where there are no limits given in STANAG 1110 or STANAG 7036, the limits in the product specifications apply.

d. Visual Appearance Check. This is a visual check of the fuels appearance: check fuel by visual means on clarity, solid matter and undissolved water at ambient temperature. The sample has to be evaluated in a clean and colourless transparent bottle.

e. C test. Table 2-3 prescribes which tests are to be performed to fulfil the requirement for fuel testing at the type C-level.

f. C+-tests. C+-tests are designed to augment the type C-level test by providing an additional level of confidence in the basic level checks and are prescribed in Table 2-4.

g. Type A, B1 and B2 tests. For the different types of fuel the analysis required to be performed at each level is prescribed in the following tables;

g.1. Table 2-5 - Aviation gasoline F-18

g.2. Table 2-6 - Aviation turbine kerosene’s F-34, F-35, F-37, F-40, F-44

g.3. Table 2-7 - Ground diesel fuel F-54 and heating kerosene F-58

g.4. Table 2-8 - Automotive gasoline F-67

g.5. Table 2-9 – Naval distillate fuels F-75, F-76

0202. **Test Types**.

Type	Description
A	Complete specification test as per specification detailed in the contract.
B1	A limited subset of the Type A full test specification requirement that are most susceptible to deterioration through contamination with other product types.
B2	A more rigorous subset of the Type A full test specification requirement than the Type B1 test schedule and in particular aimed at those parameters susceptible to deterioration through contamination and ageing.
C	This is an appearance test plus density determination. The C-Type test is carried out to confirm that no bulk contamination has occurred during the fuel transfer process by any means of transport. The density result is compared with the value shown on the documentation (corrected to standard temperature conditions). The two values must not differ by more than 3.0 kg/m^3.
C+ (C plus)	C test plus additional tests. These tests are to be performed to ensure that critical properties are fulfilled and/or additives are present at the correct concentration.
Appearance	This appearance evaluation is to confirm that no free water and/or visual solid particulate are present in the fuel and that the fuel has a 'Clear & Bright' appearance at ambient temperature.

Table 2-1

Appearance tests on fuels

Fuel →	Aviation Gasoline	Aviation Kerosene	Aviation Kerosene	Aviation Kerosene	Aviation Kerosene	Ground Use Diesel	Kerosene	Kerosene Based Diesel Fuel	Ground Use Gasoline	Naval Distillate Fuel	Naval Distillate Fuel
Test ↓	F-18	F-24, F-27, F-34, F-37	F-35	F-40	F-44	F-54	F-58	F-63	F-67	F-75	F-76
Clear & Bright Note 1	x	x	x	X	x	x	x	x	x	x	x
Undissolved water	x	x	x	X	x	x	x	x	x	x	x
Sediment	x	x	x	X	x	x	x	x	x	x	x
Visual Colour	report	report	report	Report	report	report	report	report	report	report	report
Note 1. Requirement for all fuels: Clear, bright and visually free from undissolved water and solid matter at ambient temperature											

Table 2-2

C-tests on fuels

Fuel →	Aviation Gasoline	Aviation Kerosene	Aviation Kerosene	Aviation Kerosene	Aviation Kerosene	Ground Use Diesel	Kerosene	Kerosene Based Diesel Fuel	Ground Use Gasoline	Naval Distillate Fuel	Naval Distillate Fuel
Test ↓	F-18	F-24, F-27 F-34, F-37	F-35	F-40	F-44	F-54	F-58	F-63	F-67	F-75	F-76
Clear & Bright Note 1.	x	x	x	X	x	x	x	x	x	x	x
Undissolved water	x	x	x	X	x	x	x	x	x	x	x
Sediment	x	x	x	X	x	x	x	x	x	x	x
Visual Colour	report	report	report	Report	report	report	report	report	report	report	report
density at 15°C	x	x	x	X	x	x	x	x	x	x	X
Note 1. Requirement for all fuels: Clear, bright and visually free from undissolved water and solid matter at ambient temperature											

Table 2-3

C+-tests on fuels

Fuel →	Aviation Gasoline	Aviation Kerosene	Aviation Kerosene	Aviation Kerosene	Aviation Kerosene	Ground Use Diesel	Kerosene	Kerosene Based Diesel Fuel	Ground Use Gasoline	Naval Distillate Fuel	Naval Distillate Fuel
Test ↓	F-18	F-24, F-27 F-34, F-37	F-35	F-40	F-44	F-54	F-58	F-63	F-67	F-75	F-76
Clear & Bright Note 1	x	x	x	X	x	x	x	x	x	x	x
Undissolved water	x	x	x	X	x	x	x	x	x	x	x
Sediment	x	x	x	X	x	x	x	x	x	x	x
Visual Colour	report	report	report	Report	report	report	report	report	report	report	report
density at 15°C	x	x	x	X	x	x	x	x	x	x	x
Fuel System Icing Inhibitor		x Note 2		x Note 2	x Note 2						
Conductivity		x Note 2	x Note 2	x Note 2							
Flash point		x	x		x					x	x
Note 1. Requirement for all fuels: Clear, bright and visually free from undissolved water and solid matter at ambient temperature.											
Note 2. In cases of fuel delivery by truck to a single tank (bladder) BFI: all parameters to be tested prior to off load. In cases of fuel delivery by truck to a multi-tank (multi-bladder) BFI where the possibility exists for correcting failing parameters by combining fuel batches and/or correcting additive levels: parameters to be checked once tank (bladder) is full after discharge of several batches (truckloads) of fuel as part of a B1-test.											

Table 2-4

A, B1 and B2 tests for aviation gasoline F-18 (AVGAS 100 LL)

Test type → / Test ↓	A Note 1	B1	B2
Appearance Note 2	X	x	x
Colour, visual	X	x	x
Colour, Lovibond	X		
Density	X	x	x
Distillation	X	x	x
Freeze Point	X	x	x
Vapour Pressure	X	x	x
Water Reaction Note 3	X	x	x
Tetra Ethyl Lead	X	x	x
Knock Value, Lean Mixture	X		
Knock Value, Performance number	X		
Oxidation Stability	X		x
Copper Corrosion	X		x
Existent Gum	X		x
Total Sulphur	X		
Specific Energy	X		
Conductivity	x Note 4-		
Microbiological contamination			x Note 5
Test Frequency B2 tests (in months)			12 months in fixed storage media 6 months in deployable storage media Note 6
Note 1. With reference to the specification and related test methods as agreed in the contract. Otherwise the parameters identified under A, shall be met as a guideline with reference to DEFSTAN 91-90 (latest issue) grade AVGAS 100LL.			
Note 2. A visual assessment for Clear & Bright, solid matter and undissolved water is to be made at ambient temperature.			
Note 3. Optional requirement with the following limits: a. Separation phase/change in water volume maximum 2 b. Interface rating maximum 1B			
Note 4. In cases where a Static Dissipator Additive has been added to the fuel, this parameter is to be tested.			
Note 5. Routine water drains are to be performed in accordance with standard operating procedures for the infrastructure. When draining free water, visual checks for the presence of MBC shall also be made in accordance with STANAG 7063. If MBC is suspected, appropriate samples shall be taken and sent for analysis.			
Note 6. In case of storage in a humid and warm climate, the inspection interval is to be reduced to 3 months irrespective of storage media.			

Table 2-5

A, B1 and B2 tests for aviation kerosene F-24, F-27, F-34, F-35, F-37 Note 1, F-40, F-44

Test Type → / Test ↓	A Note 2	B-1	B2
Appearance Note 3	X	x	x
Colour, visual	-	x	x
Density	X	x	x
Copper Corrosion	X	x	x
Distillation	X	x	x
Existent Gum	X	x	x
Freeze Point	X	x	x
Lubricity/BOCLE	x Note 4		
Thermal Stability	X	-	x
Vapour Pressure	x only for F-40	x only for F-40	x only for F-40
Conductivity	x not for F-44	x not for F-44	x not for F-44
Flashpoint	x not for F-40	x not for F-40	x not for F-40
Fuel System Icing Inhibitor Note 5	x not for F-35	x not for F-35	x not for F-35
Additives (anti-oxidant, metal deactivator, static dissipator additive)	Report Note 6	-	-
Lead	-	x Note 7	x Note 7
Total Acid Number	X	-	-
Aromatics	X	-	-
Olefins	For F-40 and for F-44. Not for F-34/F-35/F-24/F-27 & F-37	-	-
Mercaptan Sulphur or Doctor Test Note 8	X	-	-
Sulphur, Total	X	-	-
Viscosity at -20°C	X	-	-
Heating Value Net Heat of Combustion	X	-	-
Smoke Point or Smoke Point & Naphthalenes	X	-	-
Microseparometer (MSEP)	X	-	-
Microbiological contamination			x Note 9
FAME Note 10	X	x	x
Test Frequency for B2 testing (in months)			12 months in fixed storage media 6 months in deployable storage media Note 11

Table 2-6 (Concluded on page 2-7)

Note 1. F-37 is blended at point of issue from F-34 and a Thermal Stability Additive (+100). Generally F-37 is not kept in stock. F-37 shall be tested in agreement with the requirements for F-34.
Note 2 . With reference to the specification and related test methods as agreed in the contract. Otherwise the parameters identified under A, shall be met as a guideline with reference to STANAG 3747.
Note 3. A visual assessment of the Appearance in relation to Clear & Bright, solid matter and undissolved water is to be made at ambient temperature.
Note 4. Lubricity (BOCLE test): to be reported on RCQ by the supplier in the following case; -consists of more than 95% v/v hydro-processed material of which at least 20% v/v has been severely hydro-processed material (subjected to a hydrogen partial pressure of greater than 7000 kPa (70 bar or 1015 psi) during manufacture). -if there are concerns over the fuels lubricity.
Note 5. FSII is to be checked on delivery and after 1 month if no further deliveries have been made to the storage tank.
Note 6. The dosage and trade name of all additives added to the fuel shall be reported, whether on initial manufacture or subsequently whilst moving through the supply chain.
Note 7. Dependent on previous loads carried. If the previous load is F-18 or other leaded gasoline then this is considered as cause for concern and a Lead value shall be determined before use.
Note 8. Doctor test may be performed in lieu of Mercaptan Sulphur analysis. If a positive Doctor test result is obtained the fuel must comply with Mercaptan Sulphur limit.
Note 9. Routine water drains are to be performed in accordance with standard operating procedures for the infrastructure. When draining free water, visual checks for the presence of MBC shall also be made in accordance with STANAG 7063. If MBC is suspected, appropriate samples shall be taken and sent for analysis. Any biocide addition must be in accordance with each nation's use and notification requirement found in STANAG 7063.
Note 10. FAME testing required if there is a risk of contamination if fuel is exposed to a multi-product system which contains FAME. It is imperative to use a brand new samples container.
Note 11. In case of storage in a humid and warm climate, the inspection interval is to be reduced to 3 months irrespective of storage media.

Table 2-6 (Concluded)

A, B1 and B2 tests for ground diesel fuel F-54 and kerosene F-58

Test Type → / Test ↓	A [Note 1]	B-1	B2
Appearance [Note 2]	x	x	x
Density	x	x	x
Distillation	x	x [Note 3] for F-58 only	x
Carbon Residue (on 10% distillation residue)			
Cold Filter Plugging Point	x	x for F-54 only	X for F-54 only
Microbiological contamination			x [Note 4]
Cloud Point	x		
Flash Point	x	X	x
Viscosity at 40°C	x		
Copper Corrosion	x		
Sulphur content	x		
Ash Content	x for F-54 only		
Oxidation Stability	x for F-54 only		x [Note 5] for F-54 only
Water Content	x for F-54 only	x for F-54 only	x for F-54 only
Total Contamination	x for F-54 only		
Polycyclic Aromatic Hydrocarbons	x for F-54 only		
Cetane Number	x for F-54 only		
Cetane Index	x for F-54 only		
Lubricity (wear scar diameter)	x for F-54 only		
Corrosion inhibitor	x for F-54 only Note 6		
FAME	x for F-54 only Note 7		
Composition	x for F-58 only		
Colour Saybolt	x for F-58 only		
Colour Stability	x for F-58 only		

Table 2-7 (Concluded on page 2-9)

Test Type → / Test ↓	A Note 1	B1	B2
Smoke Point	x for F-58 only		
Freeze Point	x for F-58 only		
Burning Quality	x for F-58 only		
TEST FREQUENCY for B2 testing, the tests other than the check for microbiological contamination			12 months in fixed storage media 6 months in deployable storage media note 8
Note 1. With reference to the specification and related test methods as agreed in the contract. Otherwise the parameters identified under A, shall be met as a guideline with reference to STANAG 7090.			
Note 2. A visual assessment of the Appearance in relation to Clear & Bright, solid matter and undissolved water is to be made at ambient temperature.			
Note 3. Only when a change in Colour and/or Density occurs after procurement.			
Note 4. Diesel fuel, especially those containing a proportion of bio material (FAME) is susceptible to MBC. Checks for the indication of MBC (See STANAG 7063) shall be part of the routine draining procedures. In case of doubt perform the appropriate test to confirm the presence of MBC. It is strongly advised that in cases where effective draining of storage facilities is difficult, monthly checks on the presence of MBC have to be performed using the appropriate testing method.			
Note 5. To be tested when FAME is suspected to be present.			
Note 6.As required by the procuring agency, if corrosion inhibitor is used: only approved additives are allowed.			
Note 7. F-54 with FAME, is not suitable for long-term storage. The percentage of FAME allowed in F-54 shall not exceed the limit stated in STANAG 7090.			
Note 8. In case of storage in a humid and warm climate, the inspection interval is to be reduced to 3 months irrespective of storage media.			

Table 2-7 (Concluded)

In cases where ground fuels are used for aviation purposes (i.e. UAVs), the ground fuel is to be supplied via an independent supply chain. In this independent supply chain, the fuel shall be treated as if it were aviation kerosene/gasoline. However, the respective fuel specification applies in accordance with tables 2-7 and 2-8.

A, B1 and B2 tests for automotive gasoline F-67

Test Type → / Test ↓	A Note 1	B1	B2
Appearance Note 2	x	x	x
Density	x	x	x
Distillation	x	x	x
Vapour Pressure	x	x	x
Copper Corrosion	x	x	x
Existent Gum	x	x	x
Oxidation Stability	x	x	x
Microbiological contamination			x Note 3
Research Octane Number - RON	x		
Aromatics content	x		
Benzene content	x		
Lead content	x		
Motor Octane Number - MON	x		
Olefins content	x		
Oxygen content	x		
Oxygenates content	x		
Sulphur content	x		
Vapour Lock Index	x Note 4		
TEST FREQUENCY for B2 testing, the tests other than the check for microbiological contamination			12 months in fixed storage media 6 months in deployable storage media Note 5
Note 1. With reference to the specification and related test methods as agreed in the contract. Otherwise the parameters identified under A, shall be met as a guideline with reference to STANAG 7090.			
Note 2. A visual assessment of the Appearance in relation to Clear & Bright, solid matter and undissolved water is to be made at ambient temperature.			
Note 3. Routine water drains are to be performed in accordance with standard operating procedures for the infrastructure. When draining free water, visual checks for the presence of MBC shall also be made in accordance with STANAG 7063. If MBC is suspected, appropriate samples shall be taken and sent for analysis.			
Note 4. For certain seasonal classes only.			
Note 5. In case of storage in a humid and warm climate, the inspection interval is to be reduced to 3 months irrespective of storage media.			

Table 2-8

In cases where ground fuels are used for aviation purposes (i.e. UAV's), the ground fuel is to be supplied via an independent supply chain. In this independent supply chain, the fuel shall be treated as if it were aviation kerosene/gasoline. However, the respective fuel specification applies in accordance with tables 2-7 and 2-8.

A, B-1 and B2 tests for naval distillate fuels F-75 and F-76

Test Type → / Test ↓	A [Note 1]	B1	B2
Appearance [Note 2]	x	x	x
Colour, visual	x	x	x
Density	x	x	x
Flash Point	x	x	x
Distillation	x	x [Note 3]	x
Carbon Residue			x [Note 3]
Cloud Point	x		x
Bottom Sediment and Water			x
Water Reaction or Demulsibility	x		x
Microbiological contamination			x [Note 4]
Ash content	x		
Copper Corrosion	x		
Pour Point	x		
Ignition Quality: Cetane Number or Cetane Index	x		
Sulphur content	x		
Viscosity, kinematic at 40°C	x		
Total Acid Number	x		
Strong Acid/Base Number or Inorganic Acidity or Neutrality	x		
Water and Sediment by centrifuge	x		
Accelerated Storage Stability, total sediment	x		
TEST FREQUENCY for B2 testing, the tests other than the check for microbiological contamination			12 months in fixed storage media 6 months in deployable storage media [Note 5]
Note 1. With reference to the specification and related test methods as agreed in the contract. Otherwise the parameters identified under A, shall be met as a guideline with reference to STANAG 1385.			
Note 2. A visual assessment of the Appearance in relation to Clear & Bright, solid matter and undissolved water is to be made at ambient temperature.			
Note 3. Only when a change in Colour and/or Density occurs after procurement.			
Note 4. Routine water drains are to be performed in accordance with standard operating procedures for the infrastructure. When draining free water, visual checks for the presence of MBC shall also be made in accordance with STANAG 7063. If MBC is suspected, appropriate samples shall be taken and sent for analysis.			
Note 5. In case of storage in a humid and warm climate, the inspection interval is to be reduced to 3 months irrespective of storage media.			

Table 2-9

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SECTION 3 SAMPLING

0301. **General**.

a. Sampling can be carried out at various times and for various reasons, such as:

a.1. Upon receipt: to ensure that product is on specification

a.2. During storage for custody transfer and pricing determination, or

a.3. During storage and handling to monitor fuel quality and condition.

b. Many precautions are required to ensure representative samples are taken dependent on the type of product being sampled, the type of container from which it is drawn, and the sampling procedures employed. Procedures and sample size must be suitable for sampling the specific product under the particular storage, transportation and container conditions encountered.

c. The single most important aspect when sampling fuel is to follow proper sampling procedures. Failure to provide a truly representative sample can lead to inaccurate analysis resulting in the reporting of both false positive (a pass when in fact the fuel fails) and false negative (a failure when in fact the fuel passes) results and thus placing risk on the end user. This can be in the use of fuel that is not suitable for use or the need to expend resources investigating a problem that does not exist.

0302. **Personnel Conducting Sampling**.

Only fully trained and experienced personnel shall be assigned to sample fuel products. It is critical that a truly representative sample of the product under investigation be obtained since improperly taken samples can completely invalidate a test.

0303. **Proper Identification and Logging of Samples**.

a. Immediately after sampling, each sample container shall be identified by securely attaching a Sample Identification Tag. Information on the tag shall include pertinent information to understand both the context in which the sample was taken and where it was taken from for each submission. Labels and ink used for sampling containers shall be compatible with fuels and resistant to removal or solvency. For turbine fuel, where the electrical conductivity has been previously determined, the fuel temperature at point and time of testing shall be reported.

b. A log of samples and results shall be maintained and kept by the relevant unit for a minimum of 12 months that contains as a minimum, but not limited to, the following information:

b.1. Sample number

b.2. Location sample taken (e.g. tank number, truck number, filter-separator number, etc.)

b.3. Type of sample

b.4. Date sample taken

b.5. Name of person taking sample

b.6. Reason sample taken

b.7. Product and Grade

b.8. Specification (include approved waivers on limits, if known)

b.9. Volume sample represents

b.10. Type of tests requested

b.11. Date sample sent to the laboratory

0304. **Sampling Apparatus, Containers, and Precautions**.

a. Approved sample containers shall be used as specified by ASTM, IP, or UN. Sample containers could be as follows: epoxy-coated metal containers; borosilicate (hard) glass bottles (Pyrex® is the popular brand name); polytetrafluoroethylene bottles (Teflon® is the popular brand name); polyethylene bottles; steel cans; and stainless steel beakers appropriate to the material to be sampled.

b. For the transportation of fuel, sample containers and over packs shall comply with local/national regulations for the transport of dangerous goods. Containers for the transportation of samples by air shall be of an International Civil Aviation Organisation (ICAO) approved design, and shall be dispatched in accordance with the latest edition of the “ICAO” Technical Instructions for the Safe Transport of Dangerous Goods by air and “IATA Dangerous Goods Regulations”.

c. Samples of fuel submitted specifically for appearance test shall whenever practicable be collected in clear glass bottles and protected from exposure to sunlight. For sampling of aviation turbine fuels for water reaction and thermal stability analysis, epoxy-coated metal containers conforming to ASTM D4306 that have been pre-soaked with the product being sampled are preferred. If none are available, then clear or amber 4L glass containers may be used although shall be prepared (e.g. wrapped in aluminium foil) to prevent light absorption. Some products, especially gasoline, will change colour rapidly on exposure to sunlight resulting in a rapid increase in gum and a decrease in stability. Lead additives, such as tetraethyl lead, are particularly unstable in sunlight and may appear as a grey or

an off white precipitate on the bottom of the sample container. If clear glass bottles are the only containers available for sampling product containing lead, the bottles shall be covered with foil or paper immediately after filling to avoid exposure to sunlight.

c.1. The amount of sample to be taken is as follows:

c.1.1. Normal Sample Size: Normally, the liquid sample volume submitted for type B is 4 litres, or for type C analysis 1 litre. Samples of aviation turbine fuel requiring full specification testing (type A) will require up to 8 litres (2 X 4 litres portions), one portion of which will be used for the particulate contamination test. The possible partitioning of the sample between different parties such as supplier, client, local customs in case of custody transfer, must be considered in order to take the respective number and adequate fuel sample volume. Sufficient volume of fuel shall be drawn in order to prepare duplicate samples.

c.1.2. Special Sample Size: Special samples can vary from 1 litre to several litres dependent on the circumstance. Aviation gasoline samples requiring ASTM D909 aviation supercharge method of determining performance numbers shall be a minimum of 20 litres unless otherwise directed.

d. All sampling apparatus and containers shall be thoroughly clean and dry and special care shall be taken to ensure no lint or fibrous material remains in or on them. Unless otherwise specified in the test procedures, apparatus and containers shall be rinsed with a portion of the product being sampled to ensure they do not contaminate the sample to be tested with the previous sampled material. Care must be exerted if sample containers have been previously used since they could possibly contaminate the fuel being sampled. In all circumstances care shall be taken to prevent as far as practicable the ingress of foreign matter not associated with the fuel into the sample vessel. Equipment used to draw aviation fuel samples should be dedicated and marked accordingly.

Note: it is recommended to have a separate sampling device for use with low/ultra low sulphur products as sulphur analysis is very sensitive to minute traces of any high sulphur product previously sampled. If aviation fuel samples are taken to check for contamination with fatty acid methyl esters (FAME) then it is imperative that a brand new sample container is used.

e. Sufficient liquid product shall be in the sample lines and fittings before taking any sample.

f. Containers such as drums shall be sampled using a glass thief or metal sampling tube designed for the purpose. For further guidance the user shall refer to Section 6.

g. Immediately after taking the sample, the sample container is to be securely sealed. The use of sealing wax, paraffin, rubber gaskets, pressure sensitive tapes, or similar material to seal containers is not permitted. Lightweight sample containers shall be adequately packaged to withstand the rigours of transportation. To prevent leakage caused by thermal expansion of the product, sample containers shall not be filled above 90% capacity.

h. Sampling apparatus shall be cleaned immediately after use and stored so it will remain clean until next use. It is not recommended to use detergents, owing to the difficulties in ensuring that detergent residues are removed.

i. Samples of gasoline and aviation turbine fuels requiring a vapour pressure test to be performed shall be carefully handled and collected to prevent as far as is practically possible the loss of light-ends. Vapour pressure determinations are extremely sensitive to evaporation losses and to slight changes in composition. Whenever practicable, arrangements should be made to maintain liquid fuel samples at a temperature between minus 1°C and plus 4°C. This helps preserve its characteristics from the point of sampling to the laboratory.

j. When obtaining, storing, or handling samples, all necessary precautions shall be observed to ensure that they are truly representative of the product to be tested and where necessary satisfactory for vapour pressure tests.

k. If the densities of the fuel samples taken from the upper, middle and lower levels of a tank do not differ by more than 3 kg/m³ then a composite of these samples can be made for additional testing. If the density variation is greater than 3 kg/m³, the individual samples must be tested separately due to layering for conformance to the product specification. In the case of Jet Fuel:

k.1. If there is tank layering, the densities of the upper, middle and lower (U_M_L) samples shall fall between the minimum and maximum of the batches in the tank content list.

k.2. For batches received from a non-positive segregated system, additionally the flash point, freeze point and distillation results from each sample (U_M_L) should be reported and verified. The results shall be within the highest and lowest results of the batches in the tank content list, taking into account acceptable deviations up to the reproducibility of the used test method.

k.3. If there are no outliers, a composite sample shall be prepared from the U-M-L samples for analysis and retention, otherwise further investigation shall be conducted to identify any contamination. The density extremes and any additional tests shall be reported

k.4. If a tank is homogeneous (no layering), an all-level sample may replace the composite sample.

.

0305. **Representative Samples**.

a. A sample is a portion of fuel taken which represents that entire batch or delivery or a specific location within a tank or container. Type and quantity of samples and sample containers must be chosen to ensure that the samples are representative of the fuel in question and are satisfactory for the purpose intended.

b. The different types of samples are as follows:

b.1. All level sample: A sample obtained by submerging a closed sampler (closed bottle) to a point as near as possible to the draw off level, then opening the sampler and raising it at such a rate that it is about 75 percent full as it emerges from the liquid.

b.2. Spot Sample: A sample taken at a specific location/level within a tank or other container, or from a line at a specific time during a pumping operation.

b.3. Top Sample: A spot sample taken 15 cm (6 inches) below the fluid surface within a tank or other container contents.

b.4. Upper Sample: A spot sample taken from the middle of the upper third of the fluid within a tank or other container contents.

b.5. Middle Sample: A spot sample taken at the middle height of the fluid within a tank or other container contents.

b.6. Lower Sample: A spot sample taken at the middle of the lower third of the fluid within a tank or other container contents.

b.7. Bottom Sample: A sample obtained at the bottom surface of the tank, container, or line at its lowest point.

b.8. Drain Sample: A sample obtained from the water draw off, sump or discharge valve.

NOTE. Drain and bottom samples are usually obtained to check for water, sludge, scale, or other contaminants.

b.9. Single Tank Composite Sample: A sample consisting of a blend of the upper, middle, and lower samples of the tank contents. The portion of the sample quantity to be taken at each level varies according to the type of tank (e.g. vertical or horizontal) and shall be determined by applicable procedure.

b.10. Multiple Tank Composite Sample: A sample consisting of a blend of individual all-level samples from each compartment of the ship, barge, or carrier containing the same grade of product in proportion to the volume of product in each compartment.

b.11. Outlet (suction) Sample: A sample taken at the level of the tank outlet.

b.12. Automatic Sample (Line Sample): A sample taken from a pipeline conveying the product in such a manner that ensures a representative average of the stream throughout the period of transit. Such samples are not deemed acceptable for the initial establishment of a batch.

b.13. Hose Sample: A sample obtained from a refuelling vehicle or dispensing cabinet delivery hose. This type can also be termed an 'open line' sample.

b.14. Tube or Thief Sample: Either a core or spot sample from a specified point in the container taken with a sampling tube or special thief. When sampling fuel drums, contamination that may have settled out shall be avoided.

b.15. Batch/Lot Samples: A sample obtained from a collection of units of packaged products.

0306. **Sampling Procedures and Guidance**.

a. Fuel samples taken manually shall be done in accordance with Manual Sampling of Petroleum and Fuels (ASTM D 4057), Petroleum Liquids Manual Sampling (IP 475/ISO 3170) or equivalent national procedures.

b. In-line sampling shall be in accordance with Automatic Sampling of Petroleum and Fuels (ASTM D 4177), or as prescribed by product specification or contract requirements. Such samples are not deemed acceptable for the initial establishment of a batch.

c. Product lot acceptance in case of large shipment of packed fuels can be assessed in accordance with ANSI Z1.4 – Sampling Tables, API MPMS, Chapter 8. 1 – Standard Practice for Manual Sampling of Petroleum and Fuels.

d. A retain sample is considered as a witness sample if all parties involved were present during the sampling or if not all parties were able to be present, agreed to consider it as a witness sample in a written mutual understanding.

0307. **Tactical Equipment**.

a. The procedure for sampling of tactical equipment is not to be confused with the requirement for fuel tank sump draining, which is to be carried out regularly.

b. The reason for obtaining a sample from the tank is to determine the quality of fuel in the tactical equipment. Most samples will be obtained from the tank sump drain, (as this is the most convenient location) however, special precautions must be taken prior to obtaining the sample. In order that the sample be representative, any foreign material which has accumulated at the low point or sump of the tank (for which it was designed), must first be removed by flushing. Unless otherwise specifically stated, the following procedures shall be followed to obtain a representative sample the tank:

b.1. Using a bonded container (pail, large jar, etc.), a minimum of 4L of fuel shall be drained from the equipment sump drain and discarded as per local regulations. This fuel shall not to be tested.

b.2. The sampling container shall be rinsed thoroughly three times with the fuel to be sampled prior to filling.

b.3. The quantity of fuel required for testing shall be taken.

0308. **Refuelling Vehicles**.

Samples taken from refuelling vehicles can be taken from several points. Generally most dispensing equipment will have an in-line sampler connection point or a draw-off valve downstream of the filtration vessel used for obtaining a sample via Matched Weight Monitor sampler in by-pass mode or by using a cheater hose. Samples can also be taken either from the nozzle (open line) or from the tank by dipping through the overhead hatch (this should only be used as a last resort) or from the low level drain point (if taken from the low level drain point care should be taken to ensure that any accumulated water and/or particulate is first discarded before taking the sample. Low pressure hoses may be sampled directly from the nozzle spout; high pressure hoses may be sampled from the Matched Weight Monitor sampling port for gravimetric analysis but by taking samples directly from nozzles you are more susceptible to accumulating particulate contaminants in the sample. Other sampling devices/locations can also be encountered. Samples shall never be taken from the filter vessel sump, unless specifically directed to do so in the course of an investigation.

0309. **Refuelling Tender Fill-Stand**.

An in-line sample connection point or a draw-off valve downstream of the filtration vessel is to be used for gaining a sample via Matched Weight Monitor sampler in test mode. If not available, the fill-stand nozzle, if present, can be used to obtain a representative sample of fuel being delivered to the refuelling tender. At this point the fuel has already passed through at least one Filter Water Separator. It is important to ensure that the fill-stand line has been drained from its contaminant and that fuel has been re-circulated prior to sampling.

0310. **Bulk Storage Tanks and Marine Vessels**.

a. A representative fuel sample from a bulk storage tank or marine vessel cargo tank shall be obtained by dipping, using a weighted sampling beaker or other acceptable sampling equipment. Multiple samples may be required based on the size of the tank and number of compartments to be tested.

b. Unless specifically required for special testing, samples shall not be taken through storage tank clean-out lines, manifolds, water draw-offs, bleeder valves, or hose nozzles. Such samples would not be representative of the product in the tank. When it is necessary to sample service station tanks and access to such tanks cannot be gained though a manhole or sampling hatch, the tanks may be sampled through a servicing hose after first discharging from the hose a volume of product estimated at two-times the capacity of the piping system.

0311. **Laboratory Handling of Samples**.

a. Samples shall be registered in accordance with the laboratory procedures and shall be tested based on the respective priority. The following requirements should be noted;

a.1. All samples shall be properly labelled.

a.2. Fuel samples are required to be conditioned prior to performing certain test.

a.3. Samples shall be thoroughly mixed prior to performing the required test to ensure homogeneity.

a.4. Good sample handling is essential to prevent external contamination.

a.5. Retained samples, witness samples, and remaining fuel sample not tested shall be kept in the original container in a controlled environment and stored in accordance with local and national directives for a minimum of 30 days. All samples shall be readily available in cases of dispute with a fuel supplier or to perform additional tests.

SECTION 4 QUALITY CONTROL IN ROUTINE CIRCUMSTANCES

0401. **General**.

a. This section describes the different possible logistic situations regarding fuels distribution and the relevant minimum quality control procedures that have to be implemented. They are simple elements from one point to another one of fuels distribution chains. These situations represent normal operations on national territory, military exercises or expeditionary operations.

b. If these situations are either not representative or can not be applied, refer to Section 5.

c. During transfers of product, type C and C+ tests shall be recorded and kept for at least one year. An example of an acceptable Test Results Form (see Section 0912) has been included.

0402. **Flowcharts**.

a. The flowcharts illustrate the basic elements that constitute a fuel supply chain: each element describes the point of origin of the fuel, its point of delivery, the means of transportation between these two points and the different tests to be performed on the fuel all along this part of the logistic chain.

b. The layout of the charts is as follows:

Aviation Fuels F-35/F-34/F-44

From	To	Remarks	Table
Supplier Fuel Terminal	BFI	Custody transfer point at the delivery point of the Supplier Fuel Terminal	Table 4-1
Supplier Fuel Terminal	BFI	Custody transfer point at the entry point of the BFI	Table 4-2
BFI Nation A	BFI Nation A		Table 4-3
BFI Nation A	BFI Nation B or NPS	Custody transfer point at the delivery point of BFI Nation A	Table 4-4
BFI Nation A	BFI Nation B or NATO Pipeline and Storage System (NPS)	Custody transfer point at the entry point of BFI Nation B	Table 4-5
Civilian pipeline system	NPS		Table 4-6
Truck	Truck		Table 4-7
BFI	Aircraft		Table 4-8
Aircraft wet wing	Tank		Table 4-9

Aviation Fuels F-44 only

From	To	Remarks	Table
Supplier Fuel Terminal	Military ship (Supply ship or Warship)	Custody transfer point at the Supplier Fuel Terminal	Table 4-10
Supplier Fuel Terminal	Military ship (Supply ship or Warship)	Custody transfer point at the military ship	Table 4-11
BFI Nation A	Military ship Nation A (Supply ship or War ship)		Table 4-12
BFI Nation A	Military ship Nation B	Custody transfer point at the delivery point of BFI Nation A)	Table 4-13
Supply ship	Warship		Table 4-14
Storage Tank to for propulsion and energy generation	Daytank	War ship internal fuel transfer	Table 4-15
Warship	Aircraft		Table 4-16

Ground Fuels F-54/F-67

F-63 is only available just before issuing to ground systems and not present in the complete Fuel supply Chain. This fuel is not addressed in the flowcharts.

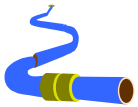
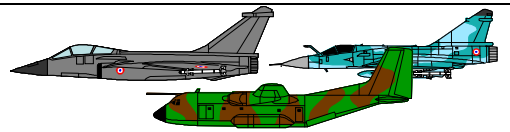
From	To	Remarks	Table
Supplier Fuel Terminal	BFI	Custody transfer point at the delivery point of the Supplier Fuel Terminal	Table 4-17
Supplier Fuel Terminal	BFI	Custody transfer point at the entry point of the BFI	Table 4-18
BFI Nation A	BFI Nation A		Table 4-19
BFI Nation A	BFI Nation B or NPS	Custody transfer point at the delivery point of BFI Nation A	Table 4-20
BFI Nation A	BFI Nation B or NPS	Custody transfer point at the entry point of BFI Nation B	Table 4-21
Civilian pipeline system	NPS		Table 4-22
BFI	Military Fuel Station	Custody transfer point at the delivery point of BFI	Table 4-23
BFI	Military Fuel Station	Custody transfer point at the entry point of the Military Fuel Station	Table 4-24

(Deployable) BFI	Military Ground Equipment		Table 4-25

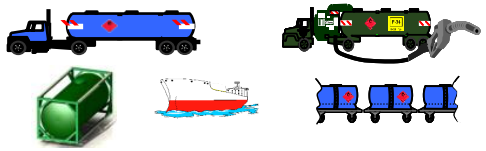
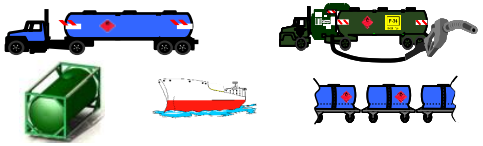
Naval Fuels F-75/F-76

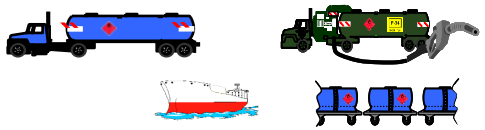
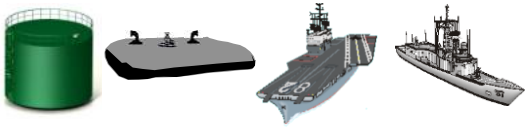
From	To	Remarks	Table
Supplier Fuel Terminal	BFI	Custody transfer point at the delivery point of the Supplier Fuel Terminal	Table 4-26
Supplier Fuel Terminal	BFI	Custody transfer point at the entry point of the BFI	Table 4-27
Supplier Fuel Terminal	Military Supply Ship	Custody transfer point at the Supplier Fuel Terminal	Table 4-28
Supplier Fuel Terminal	Military War Ship	Custody transfer point at the Supplier Fuel Terminal	Table 4-29
Supplier Fuel Terminal	Military Supply Ship	Custody transfer point at the military ship	Table 4-30
Supplier Fuel Terminal	Military War Ship	Custody transfer point at the military ship	Table 4-31
BFI Nation A	Military Supply Ship Nation A		Table 4-32
BFI Nation A	Military War Ship Nation A		Table 4-33
BFI Nation A	Military Supply Ship Nation B	Custody transfer point at the delivery point of BFI Nation A	Table 4-34
BFI Nation A	Military War Ship Nation B	Custody transfer point at the delivery point of BFI Nation A	Table 4-35
BFI Nation A	Military Supply Ship Nation B	Custody transfer point at the Military Supply Ship	Table 4-36
Supply Ship	War Ship		Table 4-37

c. Flowcharts Pictograms

	**Road Tank Vehicle**		**Mobile Filtration System**
	**Pipeline**		**Supplier Fuel Terminal**
	**Iso Container Supplier or Military**		**Bulk Fuel Installation**
	**Rail Cars**		**Refueller System**
	**Marine Vessels**		**Aircraft**
	**Military Fuel Station**		**Military Ground Equipment**
	**Jerrican**		**Custody Transfer Point**

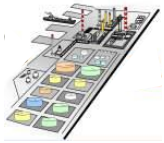
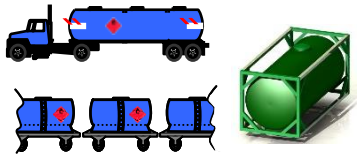
d. Terminology

TERMINOLOGY		
BFI		Bulk Fuel Installation (BFI) consists of fixed infrastructure tanks or deployable collapsible tanks. Unless otherwise stated, this acronym applies to either Troup Contributing Nation's or NATO Operated BFI.
Before loading		Before fuel is transferred into a means of transportation or just at the beginning of transfer.
		Just at the beginning of fuel introduction to the pipeline.
After loading		Once the filling of the transportation vehicle is complete.
		Not applicable.
Means of transportation		**Fuel transportation phase** using the vehicle as identified by the pictogram as it appears on the chart. It is the supplier's responsibility to ensure product quality within the vehicle when the custody transfer point is located after fuel transportation. It is the receiver's responsibility to ensure product quality when the custody transfer point is located prior to fuel transportation.

TERMINOLOGY		
Before unloading		Before fuel transfer into any receipt tank.
		At the beginning of fuel introduction in the receipt tank(s)
Receipt tank		Any BFI or Ship tanks.

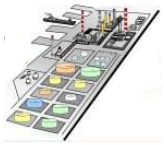
Aviation Fuels flowcharts

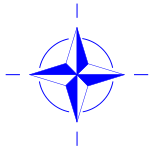
Table 4-1: Supplier Fuel Terminal to BFI (custody transfer point at the delivery point of the Supplier Fuel Terminal: to be physically determined

AVIATION Fuels : F-35/F-34/F-44				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.    				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Transportation vehicle**	**Before unloading (1)**	**Receipt tank**
• Rail tank cars and road tankers should be inspected to ensure that they are clean and free of water before loading, which may be done by draining the low points. • **Type C+** on an in-line sample at the loading point of the head of each batch and after change of issue tank. Results to be checked with the suppliers release certificate. Any discrepancies are to be	After 5 minutes of settlement and draining, a Visual Appearance check of each compartment. For the first vessel of the day or after a batch switch, Type C+ test. Results to be checked with the suppliers quality certificate. Any discrepancies are to be identified and investigated.		• **Type C** on 1 sample (all levels or drain) from each compartment of the transportation vehicle. • Type C results to be checked with the suppliers release certificate. Any discrepancies are to be identified and fuel not unloaded until resolved. • One copy per truck / train / container. • Retain sample by transporter (all levels or drain) for each	• **Type C+** on composite tank sample if received from a dedicated vessel, otherwise a **Type B1** on all level sample taken from each tank after the appropriate settling time.

AVIATION Fuels : F-35/F-34/F-44

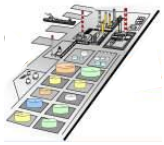
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.



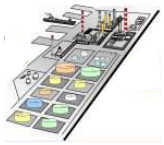

DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Transportation vehicle**	**Before unloading (1)**	**Receipt tank**
identified and investigated. • Retain sample if applicable as per contract.			compartment of the means of transportation.	
• **Type C+** on line samples of every batch for a positive segregation system, otherwise a **Type B-1** on composite line sample. • All results to be checked with the supplier's quality certificate. Any discrepancies are to be identified and investigated. Retain sample if applicable as per contract.	**Intentionally Blank**	 	• **Type C+** on line sample taken at the start, middle and end of the delivery • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Composite line retain sample to be kept by the transporter, if application as per contract.	• After appropriate settling time, take a composite sample to perform a **Type C**+ if received from a positive segregated system, otherwise a **Type B1** (or if any doubt).

AVIATION Fuels : F-35/F-34/F-44

Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.



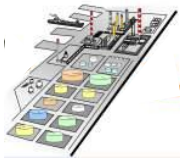
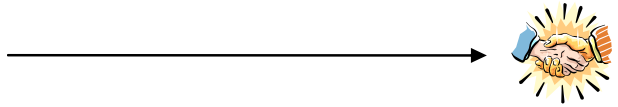
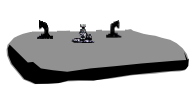
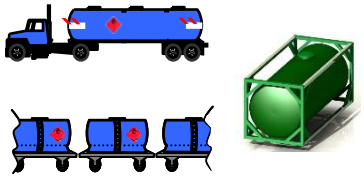
DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Transportation vehicle**	**Before unloading (1)**	**Receipt tank**
• **Type C+** on an in-line sample at the loading point of the head of each batch and results to be checked with the supplier's quality certificate. Any discrepancies are to be identified and investigated. • Retain sample if applicable as per contract.	• **Type C+** on each compartment. • In the case of a non-dedicated ship, a **Type B1** on ship's multi tank composite sample(s) (MTC; representing maximum 7 compartments). Retain sample if applicable. The test need not to delay the departure of the ship.		• **Type C** on 1 sample for each compartment. • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Each cargo compartment is to be sounded for water using water-finding paste. • For the introduction in a NPS, **Type A** on the MTC sample(s))up to 7 compartments). Retain sample if applicable.	• After the appropriate settling time has been observed, take a composite sample to perform a **Type C+** if received from a dedicated ship, otherwise a **Type B1**. • **Type A** on in-line sample or on each consolidated tank after settling time for definitive acceptance into the NPS. • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated.

AVIATION Fuels : F-35/F-34/F-44				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.    				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Transportation vehicle**	**Before unloading (1)**	**Receipt tank**
Commercial industry practices shall be applied (Ex : sampling and analysis during loading)				

(1) The density measured during the type C analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.

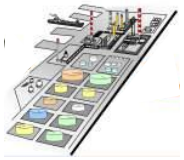
Table 4-1 (Concluded)

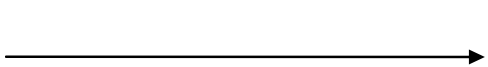
Table 4-2: Supplier fuel terminal to BFI (custody transfer point at the entry point of the BFI: to be determined physically)

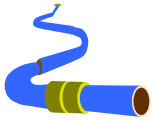
AVIATION Fuels: F-35/F-34/F-44				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.    				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Transportation vehicle**	**A. Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C** on 1 sample (all levels or drain) from each compartment of the transportation vehicle. • Type C results to be checked with the suppliers release certificate. Any discrepancies are to be identified and fuel not unloaded until resolved. • Retain sample by transporter (all levels or drain) for each compartment of the mean of transportation).	• **Type B1** on all level sample taken in every reception tank after settling time (non-dedicated means only or doubt on the dedication). • **Type C+** on composite tank sample if received from a dedicated vessel.

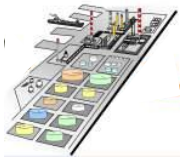
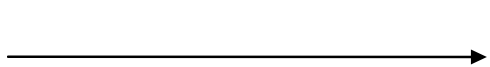
AVIATION Fuels: F-35/F-34/F-44

Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.





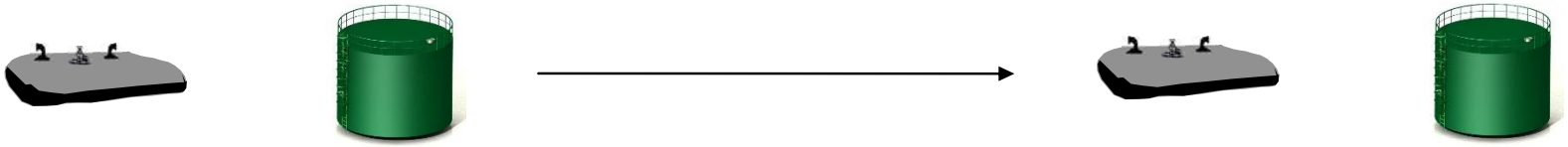
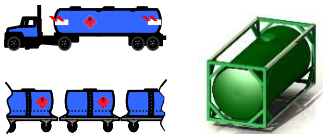
DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Transportation vehicle**	**A. Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C+** on in-line sampls taken at the stat, middle and nd of the delivery. If a change of batch is advisedfor the purposes of quality control the new batch shall be considered as being a new delivery. • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Line retain sample to be kept by the transporter.	• **Type C+** on a composite tank sample if received from a positive segregated system taken in every reception tank after settling time, otherwise a Type B1 (or if any doubt).

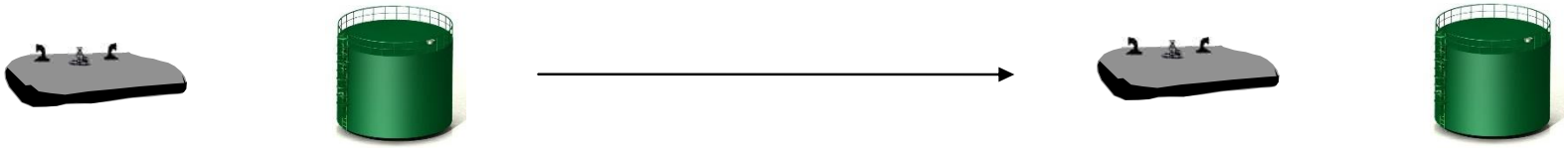
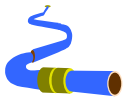
AVIATION Fuels: F-35/F-34/F-44				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification. 		   		
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Transportation vehicle**	**A. Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C** on 1 sample for each compartment. • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Each cargo compartment is to be sounded for water using water-finding paste. • In the case of a non-dedicated ship or for the introduction in a NPS, **Type A** on the MTC sample(s))up to 7 compartments). Retain sample if applicable.	• After the appropriate settling time, take a composite sample to perform a **Type C+** if received from a dedicated ship, otherwise a **Type B1**. has been observed. • **Type A** on in-line sample or on each consolidated tank after settling time for definitive acceptance into the NPS. • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated.

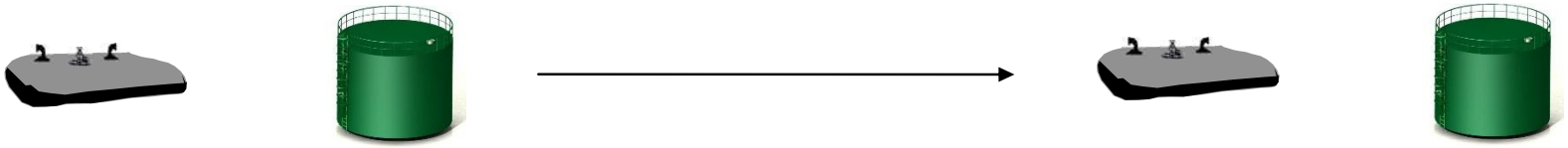
(1) The density measured during the type C analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.

Table 4-2 (Concluded)

Table 4-3: BFI Nation A to BFI Nation A

AVIATION Fuels: F-35/F-34/F-44				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• Rail tank cars and road tankers should be inspected to ensure that they are clean and free of water before loading, which may be done by draining the low points. • **Type C+** on an in-line sample at the loading point of the head of each batch and results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated.	• After 5' of settlement and draining, a Visual Appearance check of each compartment. For the first vessel of the day or after a batch switch, Type C+ test. Results to be checked with the suppliers quality certificate. Any discrepancies are to be identified and investigated.		• **Type C** on 1 sample (all levels or drain) from each compartment of the transportation vehicle. • **Type C** results to be checked with the suppliers release certificate. Any discrepancies are to be identified and fuel not unloaded until resolved. • One copy per truck / train / container. • Retain sample by transporter (all levels or drain) for each compartment of the means of transportation.	• **Type C+** on composite tank sample if received from a dedicated vessel, otherwise a **Type B1** on all level sample taken from each tank after the appropriate settling time.

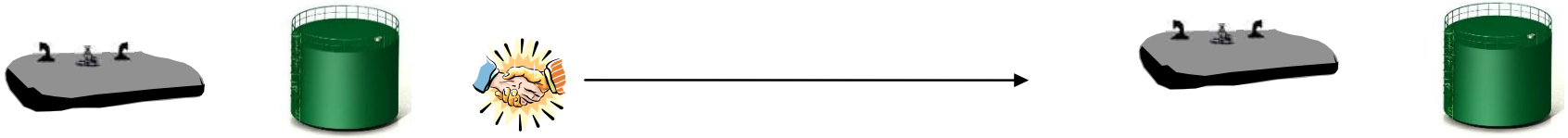
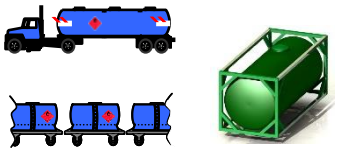
AVIATION Fuels: F-35/F-34/F-44				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• Retain sample if applicable as per contract. •				
• **Type C+** on line samples of every batch for a positive segregation system, otherwise a **Type B-1** on composite line sample. • All results to be checked with the supplier's quality certificate. Any discrepancies are to be identified and investigated. • Retain sample if applicable as per contract.	**Intentionally Blank**		• **Type C** on line sample taken at the start, middle and end of the delivery • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Composite line sample to be retained. , if applicable as per contract.	• After appropriate settling time, take a composite sample to perform a **Type C**+ if received from a positive segregated system, otherwise a **Type B1** (or if any doubt).

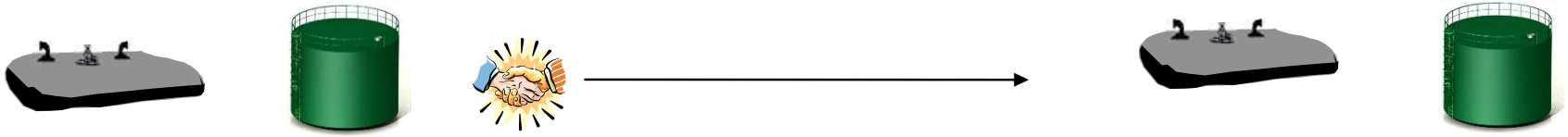
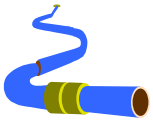
AVIATION Fuels: F-35/F-34/F-44				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• **Type C+** on an in-line sample at the loading point of the head of each batch and results to be checked with the supplier's quality certificate. Any discrepancies are to be identified and investigated. • Retain sample if applicable as per contract.	• **Type C+** on each compartment. • In the case of a non-dedicated ship, a **Type B1** on ship's multi tank composite sample(s) (MTC; representing maximum 7 compartment). Retain sample if applicable. The test need not to delay the departure of the ship.		• **Type C** on 1 sample for each compartment. • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Each cargo compartment is to be sounded for water using water-finding paste. • In the case of a non-dedicated ship or for the introduction in a NPS, **Type A** on the MTC sample(s))up to 7 compartments). Retain sample if applicable.	• After the appropriate settling time has been observed, take a composite sample to perform a **Type C+** if received from a dedicated ship, otherwise a **Type B1**. • **Type A** on in-line sample or on each consolidated tank after settling time for **definitive acceptance into the NPS**. • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated

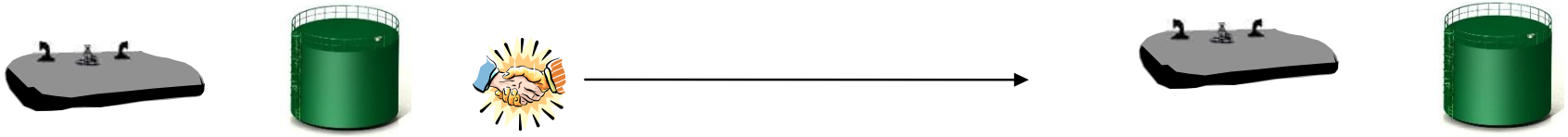
(1) The density measured during the type C analysis is to be compared with the density mentioned in certificate from the issuing tank. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.

Table 4-3 (Concluded)

Table 4-4: BFI Nation A to BFI Nation B or NPS (custody transfer point at the delivery point of BFI Nation A).

AVIATION Fuels: F-35/F-34/F-44				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• Rail tank cars and road tankers should be inspected to ensure that they are clean and free of water before loading, which may be done by draining the low points. • **Type C+** on an in-line sample at the loading point of the head of each batch and results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Retain sample if applicable as per contract.	• After 5' of settlement and draining, a Visual Appearance check of each compartment. For the first vessel of the day or after a batch switch, Type C+ test. Results to be checked with the suppliers quality certificate. Any discrepancies are to be identified and investigated.		• **Type C** on 1 sample (all levels or drain) from each compartment of the transportation vehicle. • **Type C** results to be checked with the suppliers release certificate. Any discrepancies are to be identified and fuel not unloaded until resolved. • One copy per truck / train / container. • Retain sample by transporter (all levels or drain) for each compartment of the means of transportation.	• **After the appropriate settling taime has been observed Type C+** on composite tank sample if received from a dedicated vessel, otherwise a **Type B1**.

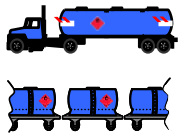
AVIATION Fuels: F-35/F-34/F-44				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• **Type C+** on line samples of every batch for a positive segregation system, otherwise a **Type B-1** on composite line sample. • All results to be checked with the supplier's quality certificate. Any discrepancies are to be identified and investigated. • Retain sample if applicable as per contract.	**Intentionally Blank**		• **Type C** on line sample taken at the start, middle and end of the delivery • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Retain composite line sample.If applicable as per contract.	• After appropriate settling time, take a composite sample to perform a **Type C+** if received from a positive segregated system, otherwise a **Type B1** (or if any doubt).
• **Type C+** on an in-line sample at the loading point of the head of each batch and results to be checked with the supplier's quality certificate. Any	• **Type C+** on each compartment. • In the case of a non-dedicated ship, a **Type B1** on ship's multi tank composite sample(s) (MTC; representing		• **Type C** on 1 sample for each compartment. • All results to be checked with the suppliers release certificate. Any discrepancies are to be	• After the appropriate settling time has been observed, take a composite sample to perform a **Type C+** if received from a

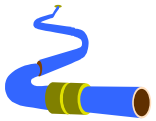
AVIATION Fuels: F-35/F-34/F-44				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
discrepancies are to be identified and investigated. • Retain sample if applicable as per contract.	maximum 7 compartment). Retain sample if applicable. The test need not to delay the departure of the ship.		identified and investigated. • Each cargo compartment is to be sounded for water using water-finding paste. • In the case of a non-dedicated ship or for the introduction in a NPS, **Type A** on the MTC sample(s))up to 7 compartments). Retain sample if applicable.	dedicated ship, otherwise a **Type B1**. • **Type A** on in-line sample or on each consolidated tank after settling time for definitive acceptance into the NPS. • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated

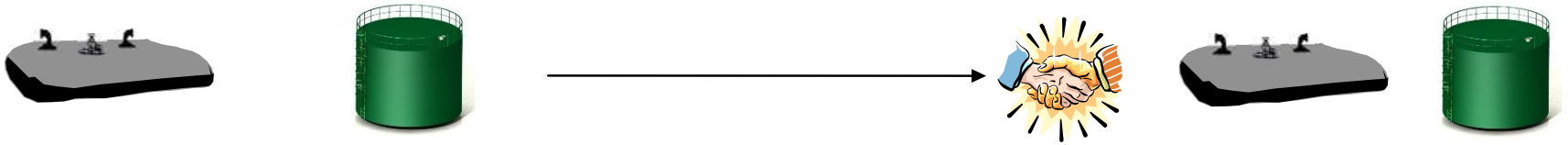
(1) The density measured during the type C analysis is to be compared with the density mentioned in certificate from the issuing tank. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.

Table 4-4 (Concluded)

Table 4-5: BFI Nation A to BFI Nation B or NPS (custody transfer point at the entry point of BFI Nation B)

AVIATION Fuels: F-35/F-34/F-44				
    				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1) (3)**	**Reception tank**
• Rail tank cars and road tankers should be inspected to ensure that they are clean and free of water before loading, which may be done by draining the low points. • **Type C+** on an in-line sample at the loading point of the head of each batch and results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Retain sample if applicable as per contract.	• After 5' of settlement and draining, a Visual Appearance check of each compartment. For the first vessel of the day or after a batch switch, Type C+ test. Results to be checked with the suppliers quality certificate. Any discrepancies are to be identified and investigated.	 	• **Type C** on 1 sample (all levels or drain) from each compartment of the transportation vehicle • **Type C** results to be checked with the suppliers release certificate. Any discrepancies are to be identified and fuel not unloaded until resolved. • One copy per truck / train / container. • Retain sample by transporter (all levels or drain) for each compartment of the means of transportation.	• After the appropriate settling time has been observed **Type C+** on composite tank sample if received from a dedicated vessel, otherwise a **Type B1** or if any doubt exists

AVIATION Fuels: F-35/F-34/F-44				
    				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1) (3)**	**Reception tank**
• **Type C+** on line samples of every batch for a positive segregation system, otherwise a **Type B-1** on composite line sample. • All results to be checked with the supplier's quality certificate. Any discrepancies are to be identified and investigated. • Retain sample if applicable as per contract.	**Intentionally Blank**		• **Type C** on line sample taken at the start, middle and end of the delivery • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Retain composite line sample.If applicable as per contract.	• After appropriate settling time, take a composite sample to perform a **Type C+** if received from a positive segregated system, oherwise a **Type B1** (or if any doubt).

AVIATION Fuels: F-35/F-34/F-44				
				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1) (3)**	**Reception tank**
• **Type C+** on an in-line sample at the loading point of the head of each batch and results to be checked with the supplier's quality certificate. Any discrepancies are to be identified and investigated. • Retain sample if applicable as per contract.	• **Type C+** on each compartment. • In the case of a non-dedicated ship, a **Type B1** on ship's multi tank composite sample(s) (MTC; representing maximum 7 compartment). Retain sample if applicable. The test need not to delay the departure of the ship.		• **Type C** on 1 sample for each compartment. • All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated. • Each cargo compartment is to be sounded for water using water-finding paste. • Retain sample if applicable.	• All results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated before product can be released.

(1) The density measured during the type C analysis is to be compared with the density mentioned in certificate from the issuing tank. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.
(2) The type C analysis shall be performed by Nation A.
(3) The Type C analysis shall be performed by Nation A or Nation B/NPS (as per agreement between the two parties) in the presence of each party's representatives.
(4) Performed by the relevant NPS if responsible for the transportation.

Table 4-5 (Concluded)

Table 4-6: Civilian pipeline system to NATO Pipeline and Storage System (NPS)

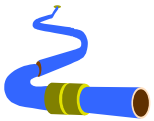
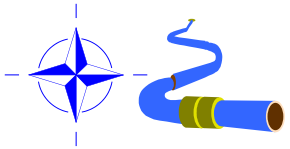
AVIATION Fuels: F-35/F-34/F-44		
		
Civilian system	**Type C+** on Line sample performed by NPS	**NPS**

Table 4-7: Truck to truck transfer

AVIATION Fuels: F-35/F-34/F-44		
		
Civilian system or Military system	**Type C** on a sample (all levels or drain) from each compartment of the transportation vehicle.	**Military system**

Table 4-8: BFI to Aircraft

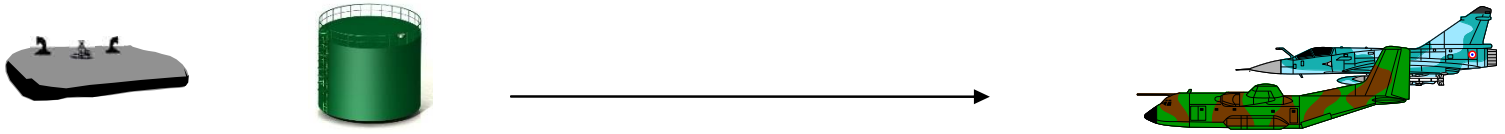
AVIATION Fuels: F-35/F-34/F-44			
			
DEPARTURE			**ARRIVAL**
Before loading	**After loading**	**Mean of transportation**	**Aircraft**
• **Appearance test** at the loading point prior to the first fuelling of the day and after change of issue tank.	• **Type C** on a sample (all levels or drain) from each compartment of the refueller after a minimum 10 minute settling time.		**Intentionally Blank**

Table 4-9: Aircraft wet wing defuelling to tank

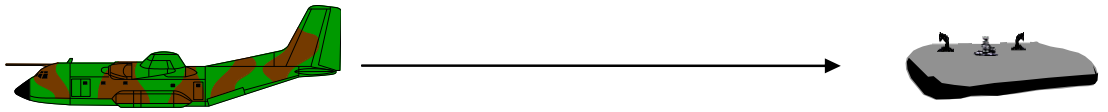
AVIATION Fuels : F-35/F-34/F-44		
		
Before offloading of aircraft	**Mean of filtration**	**Reception tank**
Type C+		**Type C+**

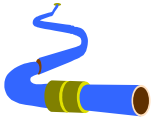
Table 4-10: Supplier Fuel Terminal to military ship (Supply ship or Warship) - Custody transfer point at the Supplier Fuel Terminal

AVIATION Fuels: F-44				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.    				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• **Type C+** on in-line sample at the loading point prior to each convoy and after change of feed tank. • Check certificate of analysis issued by the supplier.	**Intentionally Blank**		• **Type C +** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis issued by the supplier. One copy per truck.	• **Type C+** on all level sample taken in every reception tank after settling time.
• **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier. • Retain sample at the custody transfer point.	• **Type C** on each compartment. • **Type B1** on ship composite sample.		• **Type C +** on 1 sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier.	• **Type C+** on all level sample taken in every reception tank after settling time.
Commercial industry practices shall be applied (Ex : sampling and analysis during loading)			**Intentionally Blank**	**Intentionally Blank**

AVIATION Fuels: F-44

Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.



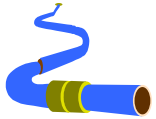

DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier. • If the pipeline is one of the NPS, and if a buffering tank has been used during the transport, a **B1 test** will be performed on the tank by NPS.	• **Type C+** on all level sample taken in every reception tank after settling time.

(1) The density measured during the type C analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.

Table 4-10 (Concluded)

Table 4-11: Supplier Fuel Terminal to military ship (Supply ship or Warship) - Custody transfer point at the military ship

AVIATION Fuels: F-44				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location)			  	
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C +** on 1 sample for each compartment. • Retain sample by the transporter (all levels or drain) for each compartment of the mean of transportation). • Each cargo compartment is to be sounded for water using water-finding paste.	• **Type C+** on all level sample taken in every reception tank after settling time.
Intentionally Blank	**Intentionally Blank**		• **Type C +** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis issued by the supplier. One copy per truck.	• **Type C+** on all level sample taken in every reception tank after settling time.

AVIATION Fuels: F-44				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location)		  		
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C +** on in-line sample. • Check certificate of analysis issued by the supplier. • If the pipeline is one of the NPS, and if a buffering tank has been used during the transport, a **B1** test will be performed on the tank by NPS.	• **Type C+** on all level sample taken in every reception tank after settling time.

(1) The density measured during the type C analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.

Table 4-11 (Concluded)

Table 4-12: BFI Nation A to Military Ship Nation A (Supply Ship or Warship)

AVIATION Fuels: F-44				
 		 		
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**Reception tank**
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C+** on 1 sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier.	• **Type C+** on all level sample taken in every reception tank after settling time.
• **Type C+** on in-line sample at the loading point prior to each convoy and after change of feed tank.	**Intentionally Blank**		• **Type C+** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis (Type C+ or B1 or B2) from the issuing tank	• **Type C+** on all level sample taken in every reception tank after settling time.

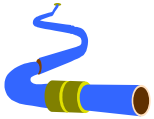
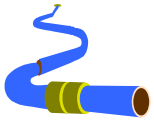
AVIATION Fuels: F-44				
   				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**Reception tank**
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier. • If the pipeline is one of the NPS, and if a buffering tank has been used during the transport, a **B1** test will be performed on the tank by NPS.	• **Type C+** on all level sample taken in every reception tank after settling time.

Table 4-12 (Concluded)

Table 4-13: BFI Nation A to Military Ship Nation B (Custody transfer point at the delivery point of BFI Nation A).

AVIATION Fuels: F-44				
    				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1) (3)**	**Reception tank**
• **Type C** on in-line sample at the loading point prior to each convoy/train and after change of feed tank. • Check certificate of analysis (Type C+ or B1 or B2) from the issuing tank.	**Intentionally Blank**		• **Type C +** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis (Type C+ or B1 or B2) from the issuing tank.	• **Type C+** on all level sample taken in every reception tank after settling time.
• **Type C** on in-line sample at the delivery point of the issuing depot. • **Type B1** on in-line sample at the delivery point of issuing (4)	**Intentionally Blank**		• **Type C** + on in-line sample. • Check certificate of analysis (Type C+ or B1 or B2) from the issuing tank.	• **Type C+** on all level sample taken in every reception tank after settling time.
• **Type C** on in-line sample.	**Intentionally Blank**		• **Type C +** on 1 sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste.	• **Type C+** on all level sample taken in every reception tank after settling time.

AVIATION Fuels: F-44				
  			 	
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1) (3)**	**Reception tank**
			• Check certificate of analysis issued by the supplier.	

(1) The density measured during the type C analysis is to be compared with the density mentioned in certificate from the issuing tank. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.
(2) The Type C analysis shall be performed by Nation A or Nation B/NPS (as per agreement between the two parties) in the presence of each party's representatives.
(3) The Type C analysis shall be performed by receiving party.
(4) Performed by the relevant NPS if responsible for the transportation.

Table 4-13 (Concluded)

Table 4-14: Supply ship to War ship

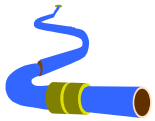
AVIATION Fuels: F-44				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**Reception tank**
Type C+ on in-line sample.	**Intentionally Blank**		**Intentionally Blank**	• **Type C+** on in-line sample. or • **Type C+** on all level sample taken in every reception tank after settling time.

Table 4-14 (Concluded)

Table 4-15: Warship internal fuel transfer from Storage Tank to Daytank.

AVIATION Fuels: F-44			
			
DEPARTURE			**ARRIVAL**
Before loading	**After loading**	**Means of transportation**	**Daytank**
Intentionally Blank	• **Type C test** on 1 sample (all levels or drain) for each compartment of the daytank after a minimum 10 minutes settling.	**Internal ship pipeline**. 	• **Appearance test** on 1 sample

Table 4-15 (Concluded)

Table 4-16: Warship to Aircraft

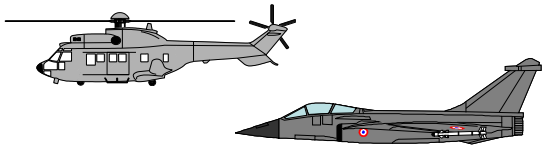
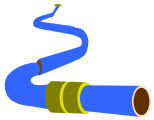
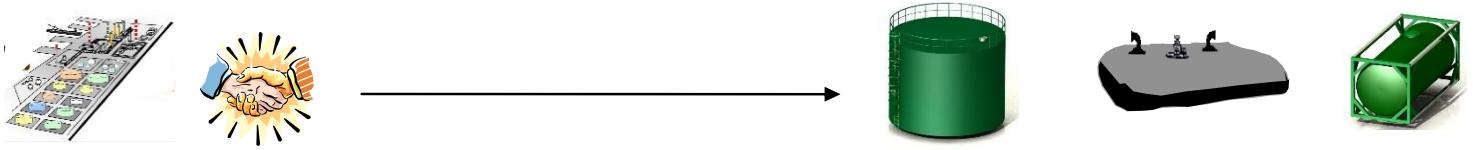
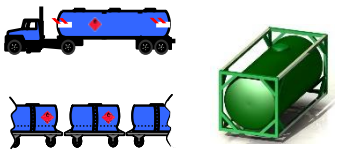
AVIATION Fuels: F-44			
			
DEPARTURE			**ARRIVAL**
Before loading	**After loading**	**Means of transportation**	**Aircraft**
Intentionally Blank	• **Visual test** on 1 sample (all levels or drain) for each compartment of the daytank after a minimum 10 minutes settling.	**Internal ship pipeline**. 	**Intentionally Blank**

Table 4-16 (Concluded)

Ground Fuels flowcharts

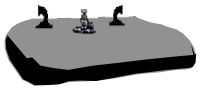
Table 4-17: Supplier Fuel Terminal to BFI (custody transfer point at the delivery point of the Supplier Fuel Terminal: to be determined physically

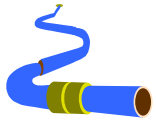
GROUND Fuels: F-54/F-67				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification. 				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**After unloading**
• Check COA • Check Issuing tank identity COA-identification information • Retain sample if applicable as per contract	**Intentionally Blank**		• **Type C** on 1 sample (all levels or drain) for each compartment of the mean of transportation • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and fuel not unloaded until resolved • One copy per truck/train/container.	• **Type B1** on all level sample taken in every reception tank after settling time (required only when the delivery is made through a non-dedicated means or doubt exists on the integrity of the supply) • **Type C+** if no B1 performed on reception tank.

GROUND Fuels: F-54/F-67

Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test.
A **Type B2** is acceptable for terminal (non refinery location) recertification.



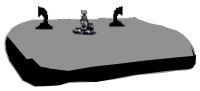



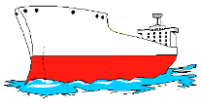

DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**After unloading**
• **Type C+** on in-line sample (mono product connected installation) • **Type B1** on in-line sample (NATO multi-product connected installation) **(2)** • Check certificate of analysis issued by the supplier. • Retain sample if applicable as per contract.	**Intentionally Blank**		• **Type C** on in-line sample taken at the start, middle and end of the delivery. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated	• **Type B1** on all level sample taken in every reception tank after settling time (NATO pipeline systems and multi-products system only). • **Type C+** on an all level sample taken from each receipt tank after settling time if no B1 performed on reception.

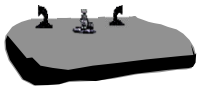
GROUND Fuels: F-54/F-67

Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test.
A **Type B2** is acceptable for terminal (non refinery location) recertification.



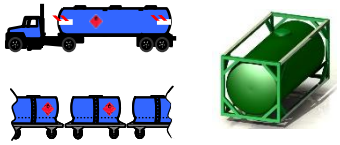

DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**After unloading**
• **Type C+** on in-line sample. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated. • Retain sample at the custody transfer point.	• **Type C** on each compartment. • **Type B1** on ship composite sample.		• **Type C** on 1 sample for each compartment. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated • Each cargo compartment is to be sounded for water using water-finding paste. • **Type A** on a composite sample (representing maximum 5 tanks) to be compared with the original type A issued from the supplier for **temporary acceptance** (product to be introduced into a NATO pipeline and storage system.	• **Type B2** on all level sample taken in every reception tank after settling time. • **Type A** on in-line sample or on each consolidated tank after settling time for **definitive acceptance (**NPS). • Only tankers transporting one type of product will be accepted into a NATO pipeline system, except for military tankers. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated

GROUND Fuels: F-54/F-67				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.     				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**After unloading**
Commercial industry practices shall be applied (Ex : sampling and analysis during loading)				

(1) The density measured during the type C analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m3, a contamination may have been occurred and investigation shall be done to explain this difference

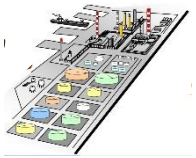
Table 4-17 (Concluded)

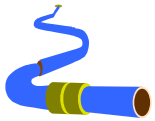
Table 4-18: Supplier Fuel Terminal to BFI (custody transfer point at the entry point of the BFI: to be determined physically)

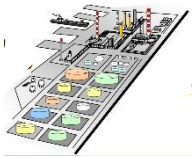
GROUND Fuels: F-54/F-67				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.  				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**After unloading**
Intentionally Blank	**Intentionally Blank**		• **Type C** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated • Retain sample by transporter (all levels or drain) for each compartment of the mean of transportation).	• **Type B1** on all level sample taken in every reception tank after settling time (non-dedicated means only or doubt on the dedication). • **Type C+** if no B1 performed on reception tank.

GROUND Fuels: F-54/F-67

Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.



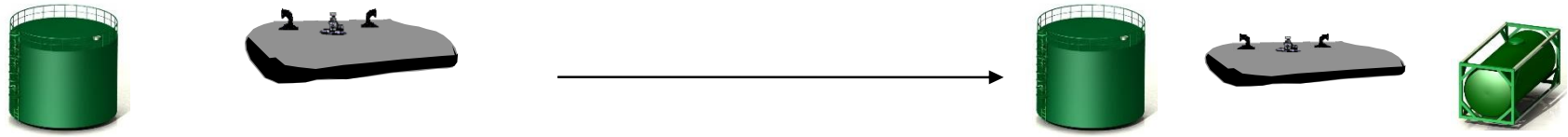
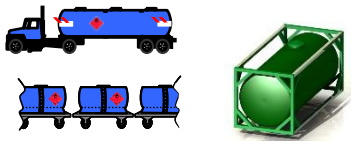
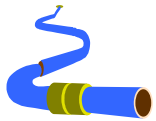
DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**After unloading**
Intentionally Blank	**Intentionally Blank**		• **Type C** on in-line sample taken at the start, middle and end of the delivery. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated • Line retain sample to be kept by the transporter	**Type B1** on all level sample taken in every reception tank after settling time (NPS and multi-products system only). • **Type C+** if no B1 performed on reception tank.

GROUND Fuels: F-54/F-67				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.  				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**After unloading**
Intentionally Blank	**Intentionally Blank**		• **Type C** on 1 sample for each compartment. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated • Each cargo compartment is to be sounded for water using water-finding paste	• **Type B2** on all level sample taken in every reception tank after settling time. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated

(1) The density measured during the type C analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference

Table 4-18 (Concluded)

Table 4-19: BFI Nation A to BFI Nation A

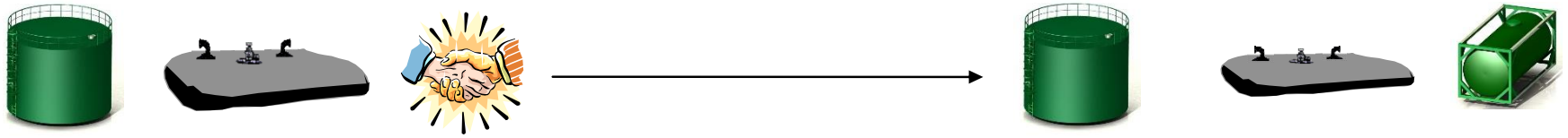
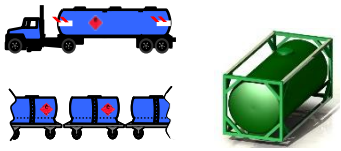
GROUND Fuels: F-54/F-67				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**After unloading**
• **Type C** on in-line sample at the loading point prior to each convoy/train and after change of feed tank	**Intentionally Blank**		• **Type C** on 1 sample for each compartment of the mean of transportation. • Results to be checked with the C-certificate of analysis from issuing tank.	• **Type B1** on all level sample taken in every reception tank after settling time (required only when the delivery is made through a non-dedicated means only or doubt exists on the integrity of the supply) • **Type C+** if no B1 performed on reception tank.
• **Type C** on in-line sample at the delivery point of the issuing depot. • **Type B1** on in-line sample at the delivery point of issuing **(2)**	**Intentionally Blank**		• **Type C** on in-line sample taken at the start, middle and end of the delivery. • Results to be checked with the B1-certificate of analysis from issuing tank.	• **Type B1** on all level sample taken in every reception tank after settling time (required only when the delivery is made through a non-dedicated means only or doubt exists on the integrity of the supply) • **Type C+** if no B1 performed on reception tank.

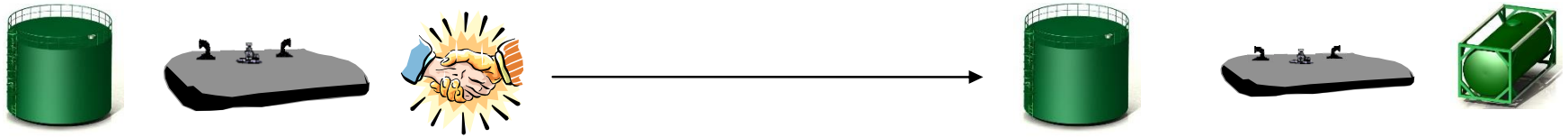
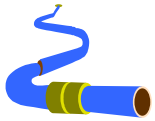
GROUND Fuels: F-54/F-67				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**After unloading**
• **Type C** on in-line sample at the loading point.	**Intentionally Blank**		• **Type C** on 1 sample for each compartment • Results to be checked with the C-certificate of analysis from issuing tank • Each cargo compartment is to be sounded for water using water-finding paste.	• **Type B2** on all level sample taken in every reception tank after settling time. • Results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated.

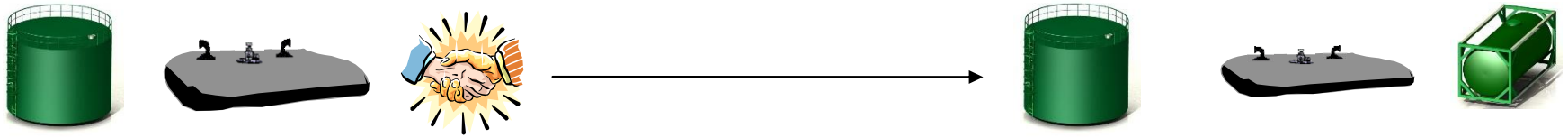
(1) The density measured during the type C analysis is to be compared with the density mentioned in certificate from the issuing tank. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference
(2) Performed by the relevant NATO Pipeline and Storage System (NPS) if responsible for the transportation

Table 4-19 (Concluded)

Table 4-20: BFI Nation A to BFI Nation B or NPS (Custody transfer point at the delivery point of BFI Nation A)

GROUND Fuels: F-54/F-67					
					
DEPARTURE			**ARRIVAL**		
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1)(3)**	**After unloading**	
• **Type C** on in-line sample at the loading point prior to each convoy/train and after change of feed tank. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated	**Intentionally Blank**		• **Type C** on 1 sample for each compartment of the mean of transportation. • Results to be checked with the C- certificate of analysis from issuing tank.	• **Type B1** on all level sample taken in every reception tank after settling time (required only when the delivery is made through a non-dedicated means only or doubt exists on the integrity of the supply) • **Type C+** if no B1 performed on reception tank.	

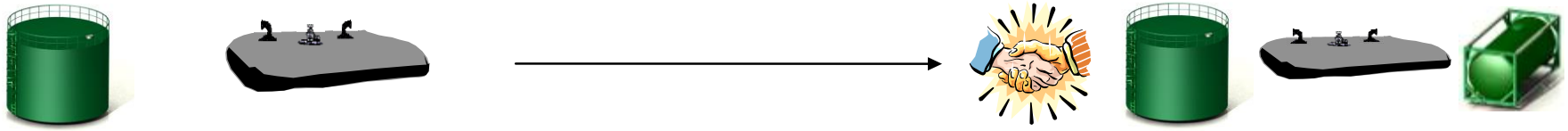
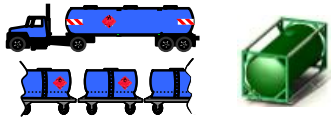
GROUND Fuels: F-54/F-67				
				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1)(3)**	**After unloading**
• **Type C** on in-line sample at the delivery point of the issuing depot. • **Type B1** on in-line sample at the delivery point of issuing **(4)** • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated	**Intentionally Blank**		• **Type C** on in-line sample taken at the start, middle and end of the delivery. • Results to be checked with the B1 certificate of analysis from issuing tank.	**Type B1** on all level sample taken in every reception tank after settling time (required only when the delivery is made through a Non dedicated means only or doubt exists on the integrity of the supply) • **Type C+** if no B1-performed on reception tank.

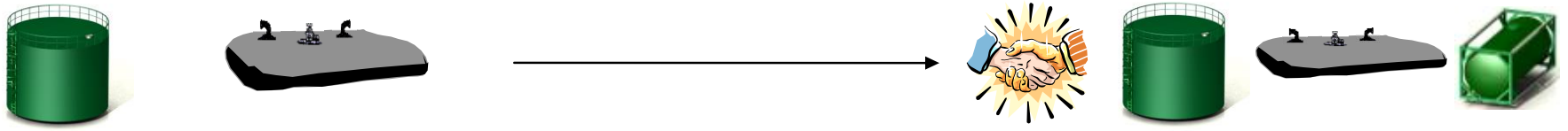
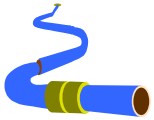
GROUND Fuels: F-54/F-67				
				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1)(3)**	**After unloading**
• **Type C** on in-line sample at the loading point.	**Intentionally Blank**		• **Type C** on 1 sample for each compartment • Results to be checked with the C-certificate of analysis from issuing tank. • Each cargo compartment is to be sounded for water using water-finding paste.	• **Type B2** on all level sample taken in every reception tank after settling time. • Results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated.

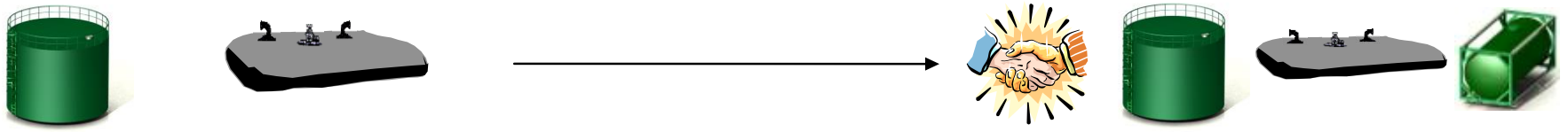
(1) The density measured during the type C analysis is to be compared with the density mentioned in certificate from the issuing tank. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.
(2) The Type C analysis shall be performed by Nation A or Nation B/NPS (agreement between the two parties) in the presence of each party's representatives.
(3) The Type C analysis shall be performed by receiving party.
(4) Performed by the relevant NPS if responsible for the transportation.

Table 4-20 (Concluded)

Table 4-21: BFI Nation A to BFI Nation B or NPS (Custody transfer point at the entry point of BFI Nation B)

GROUND Fuels: F-54/F-67				
				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1)(3)**	**After unloading**
• **Type C** on in-line sample at the loading point prior to each convoy/train and after change of feed tank. • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to be identified and investigated	**Intentionally Blank**		• **Type C** on 1 sample for each compartment of the mean of transportation. • Results to be checked with the C- certificate of analysis from issuing tank.	• **Type B1** on all level sample taken in every reception tank after settling time (required only when the delivery is made through a non-dedicated means only or doubt exists on the integrity of the supply) • **Type C+** if no B1 performed on reception tank.

GROUND Fuels: F-54/F-67				
				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1)(3)**	**After unloading**
• **Type C** on in-line sample at the delivery point of the issuing depot. • **Type B1** on in-line sample at the delivery point of issuing **(4)** • Results to be checked with the suppliers certificate of analysis. Any discrepancies are to	**Intentionally Blank**		• **Type C** on in-line sample taken at the start, middle and end of the delivery. • Results to be checked with the B1 certificate of analysis from issuing tank.	• **Type B1** on all level sample taken in every reception tank after settling time (required only when the delivery is made through a non-dedicated means only or doubt exists on the integrity of the supply) • **Type C+** if no B1
be identified and investigated				performed on reception tank.

GROUND Fuels: F-54/F-67				
				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1)(3)**	**After unloading**
• **Type C** on in-line sample at the loading point.	**Intentionally Blank**		• **Type C** on 1 sample for each compartment • Results to be checked with the C-certificate of analysis from issuing tank. • Each cargo compartment is to be sounded for water using water-finding paste.	• **Type B2** on all level sample taken in every reception tank after settling time. • Results to be checked with the suppliers release certificate. Any discrepancies are to be identified and investigated.

(1) The density measured during the type C analysis is to be compared with the density mentioned in certificate from the issuing tank. If the difference between the two figures is above 3 kg/m^3, a contamination may have been occurred and investigation shall be done to explain this difference.
(2) The Type C analysis shall be performed by Nation A.
(3) The Type C analysis shall be performed by Nation A or Nation B/NPS (agreement between the two parties) in the presence of each party's representatives
(4) Performed by the relevant NPS if responsible for the transportation.

Table 4-21 (Concluded)

Table 4-22: Civilian pipeline system to NATO Pipeline and Storage System (NPS)

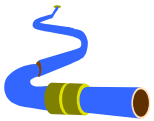
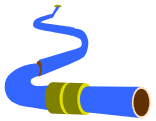
GROUND Fuels: F-54/F-67		
		
Civilian system	• **Type A** on line sample performed by NPS	**NPS**

Table 4-23: BFI to Military Fuel station (custody transfer point at the delivery point of BFI: to be determined physically).

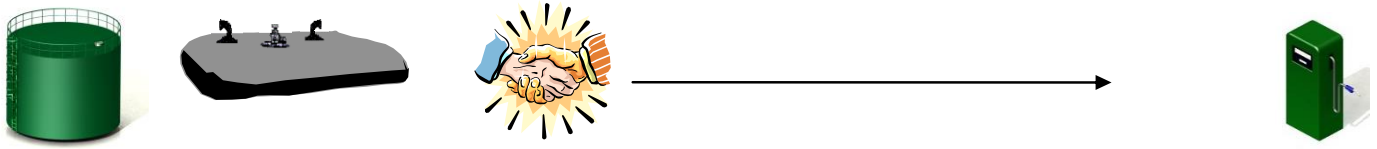
Ground Fuels: F-54/F-67				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**After unloading**
• **Appearance test** at the loading point at the first fuelling of the day and after change of feed tank.	• **Appearance test** on 1 sample (all levels or drain) for each compartment of the mean of transportation after a minimum 10 minutes settling		**Intentionally Blank**	B2 (periodically)

Table 4-24: BFI to Military Fuel Station (Custody transfer point at the entry point of the Military Fuel Station: to be determined physically)

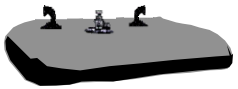
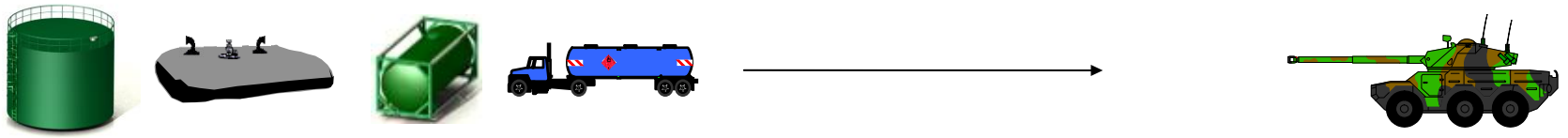
GROUND Fuels: F-54/F-67				
   				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**After unloading**
Intentionally Blank	**Intentionally Blank**		• **Type C** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Results to be checked with the certificate of analysis of the issuing tank. Any discrepancies are to be identified and investigated. • Retain sample by transporter (all levels or drain) for each compartment of the mean of transportation.	B2 (periodically)

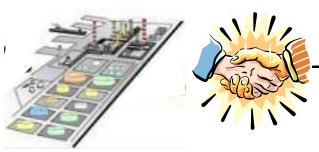
Table 4-25: (Deployable) BFI to Military Ground equipment

GROUND Fuels: F-54/F-67				
				
DEPARTURE (1)			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**After unloading**
• **Appearance test** at the loading point at the first fuelling of the day and after change of feed tank.	• **Appearance test** on 1 sample (all levels or drain) for each compartment of the mean of transportation after a minimum 10 minutes settling		**Intentionally Blank**	**Intentionally Blank**
• **Appearance test** at the loading point at the first fuelling of the day and after change of feed tank	**Intentionally Blank**		**Intentionally Blank**	**Intentionally Blank**
• **Appearance test** at the loading point at the first fuelling of the day and after change of feed tank	**Intentionally Blank**	 pump/filtration unit	**Intentionally Blank**	**Intentionally Blank**

(1) When transfer is between nations, the point of custody transfer is at departure

Naval Fuels flowcharts

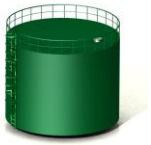
Table 4-26: Supplier Fuel Terminal to bulk fuel installation (BFI) (custody transfer point at the delivery point of the Supplier Fuel Terminal: to be determined physically).

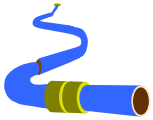
NAVAL Fuels: F-75/F-76				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.   				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• Each cargo compartment to be sounded for water using water finding paste before loading. • **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier. • Retain sample from the custody transfer point.	• **Type C** on each compartment. • **Type C+** on ship composite sample.	 	• **Type C+** on 1 representative sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier. • **Type C+** on a composite sample (representing maximum 5 tanks) to be compared with the original type A issued from the supplier for temporary acceptance	• **Type B2** on all level sample taken in every reception tank after settling time. • **Type B2** on in-line sample or on each consolidated tank after settling time for definitive acceptance (NPS). • Only tankers transporting one type of product will be accepted into a NATO pipeline system, except for military tankers.

NAVAL Fuels: F-75/F-76

Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.





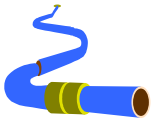

DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
			(product to be introduced into a NATO pipeline and storage system.	
Commercial industry practices shall be applied (Ex : sampling and analysis during loading)				
• **Type C+** on in-line sample (mono product connected installation) • **Type B1** on in-line sample (NATO multi-product connected installation) (2) • Check certificate of analysis issued by the supplier. Check that density is within 3 kg/m^3 Retain sample if applicable as per contract.	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier.	• **Type B2** on all level sample taken in every reception tank after settling time (NATO pipeline systems and multi-products system only). • **Type B2** performed on reception tank.

(1) The density, corrected to 15°C, measured during the type C+ analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, the product shall not be discharged until the discrepancy has been resolved to the customer's satisfaction.
(2) Performed by the relevant NATO pipeline and storage system.

Table 4-26 (Concluded)

Table 4-27: Supplier fuel terminal to BFI (custody transfer point at the entry point of the BFI: to be determined physically)

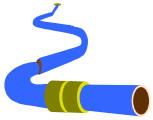
NAVAL Fuels: F-75/F-76				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.    				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**B. Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C+** on 1 representative sample for each compartment. • Retain sample by the transporter (all levels or drain) for each compartment of the mean of transportation). • Each cargo compartment is to be sounded for water using water-finding paste. •	• **Type B2** on all level sample taken in every reception tank after settling time.

Intentionally Blank	**Intentionally Blank**		• **Type C+** on in-line sample. • Line retain sample by the transporter. • Check certificate of analysis issued by the supplier.	• **Type B2** on all level sample taken in every reception tank after settling time (NPS and multi-products system only). • **Type B2** performed on a representative sample from reception tank.

(1) The density, corrected to 15°C, measured during the type C+ analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, the product shall not be discharged until the discrepancy has been resolved to the customer's satisfaction.

Table 4-27 (Concluded)

Table 4-28: Supplier Fuel Terminal to Military Supply Ship - Custody transfer point at the Supplier Fuel Terminal

NAVAL Fuels: F-75/F-76				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.   				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• **Type C+** on in-line sample at the loading point prior to each convoy and after change of feed tank. • Check certificate of analysis issued by the supplier.	**Intentionally Blank**		• **Type C+** on 1 representative sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis issued by the supplier. One copy per truck.	• **Type C+** on all level sample taken in every reception tank after settling time.
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier. • If the pipeline is one of the NPS, and if a buffering tank has been used during the transport, a **B1** test will be	• **Type C+** on all level sample taken in every reception tank after settling time.

NAVAL Fuels: F-75/F-76

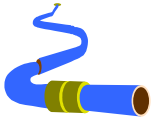
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.

DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
			performed on the tank by NPS.	
• Type C+ on in-line sample. • Check certificate of analysis issued by the supplier. • Retain sample at the custody transfer point.	• Type C+ on each compartment. • Type C+ on ship composite sample.		• **Type C+** on 1 representative sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier.	• **Type C+** on all level sample taken in every reception tank after settling time.
Commercial industry practices shall be applied (Ex : sampling and analysis during loading)				

(1) The density, corrected to 15°C, measured during the type C+ analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3kg/m3, the product shall not be discharged until the discrepancy has been resolved to the customer's satisfaction.

Table 4-28 (Concluded)

Table 4-29: Supplier Fuel Terminal to Military War Ship - Custody transfer point at the Supplier Fuel Terminal

NAVAL Fuels: F-75/F-76				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.   				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• **Type C+** on in-line sample at the loading point prior to each convoy and after change of feed tank. • Check certificate of analysis issued by the supplier.	**Intentionally Blank**		• **Type C+** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis issued by the supplier. One copy per truck.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier. • If the pipeline is one of the NPS, and if a buffering tank has been used during the transport, a **B1** test will be performed on the tank by NPS.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.

NAVAL Fuels: F-75/F-76

Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location) recertification.

DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
• Type C+ on in-line sample. • Check certificate of analysis issued by the supplier. • Retain sample at the custody transfer point.	• Type C on each compartment. • Type B1 on ship composite sample.	USA 	• **Type C+** on 1 representative sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.
Commercial industry practices shall be applied (Ex : sampling and analysis during loading)				

(1) The density, corrected to 15°C, measured during the type C+ analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3kg/m3, the product shall not be discharged until the discrepancy has been resolved to the customer's satisfaction.

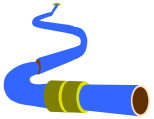
Table 4-29 (Concluded)

Table 4-30: Supplier Fuel Terminal to Military Supply ship - Custody transfer point at the military ship

NAVAL Fuels: F-75/F-76				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location)			 	
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C+** on 1 sample for each compartment. • Retain sample by the transporter (all levels or drain) for each compartment of the mean of transportation). • Each cargo compartment is to be sounded for water using water-finding paste.	• **Type C+** on all level sample taken in every reception tank after settling time.
Intentionally Blank	**Intentionally Blank**		• **Type C+** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis issued by the supplier. One copy per truck.	• **Type C+** on all level sample taken in every reception tank after settling time.

NAVAL Fuels: F-75/F-76

Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location)

DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier. • If the pipeline is one of the NPS, and if a buffering tank has been used during the transport, a **B1** test will be performed on the tank by NPS.	• **Type C+** on all level sample taken in every reception tank after settling time.

(1) The density, corrected to 15°C, measured during the type C+ analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, the product shall not be discharged until the discrepancy has been resolved to the customer's satisfaction

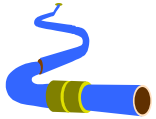
Table 4-30 (Concluded)

Table 4-31: Supplier Fuel Terminal to Military War Ship - Custody transfer point at the military ship

NAVAL Fuels: F-75/F-76				
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location)			 	
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C+** on 1 representative sample for each compartment. • Retain sample by the transporter (all levels or drain) for each compartment of the mean of transportation). • Each cargo compartment is to be sounded for water using water-finding paste.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.
Intentionally Blank	**Intentionally Blank**		• **Type C+** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis issued by the supplier. One copy per truck.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.

NAVAL Fuels: F-75/F-76

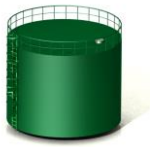
Each batch issued from a Suppliers refinery storage shall have been subjected to a **Type A** test. A **Type B2** is acceptable for terminal (non refinery location)

DEPARTURE			ARRIVAL	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1)**	**Reception tank**
Intentionally Blank	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier. • If the pipeline is one of the NPS, and if a buffering tank has been used during the transport, a **B1** test will be performed on the tank by NPS.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.

(1) The density, corrected to 15°C, measured during the type C+ analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, the product shall not be discharged until the discrepancy has been resolved to the customer's satisfaction

Table 4-31 (Concluded)

Table 4-32: BFI Nation A to military Supply ship Nation A

NAVAL Fuels: F-75/F-76				
 				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**Reception tank**
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C** on 1 representative sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier.	• **Type C+** on all level sample taken in every reception tank after settling time.
• **Type C+** on in-line sample at the loading point prior to each convoy and after change of feed tank.	**Intentionally Blank**		• **Type C** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis (**Type C+** or **B1** or **B2**) from the issuing tank	• **Type C+** on all level sample taken in every reception tank after settling time.

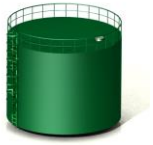
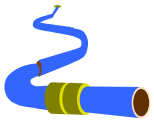
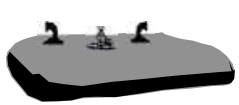
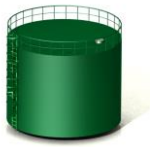
NAVAL Fuels: F-75/F-76				
  				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**Reception tank**
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C** on in-line sample. • Check certificate of analysis issued by the supplier. • If the pipeline is one of the NPS, and if a buffering tank has been used during the transport, a **B1** test will be performed on the tank by NPS.	• **Type C+** on all level sample taken in every reception tank after settling time.

Table 4-32 (Concluded)

Table 4-33: BFI Nation A to military War ship Nation A

NAVAL Fuels: F-75/F-76				
 				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**Reception tank**
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C+** on 1 representative sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.
• **Type C+** on in-line sample at the loading point prior to each convoy and after change of feed tank.	**Intentionally Blank**		• **Type C+** on 1 sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis (**Type C+** or **B1** or **B2**) from the issuing tank.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.

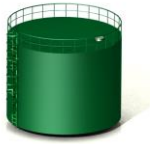
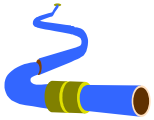
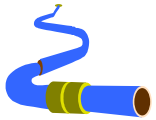
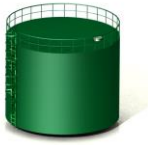
NAVAL Fuels: F-75/F-76				
 				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**Reception tank**
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis issued by the supplier. • If the pipeline is one of the NPS, and if a buffering tank has been used during the transport, a **B1** test will be performed on the tank by NPS.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.

Table 4-33 (Concluded)

Table 4-34: BFI Nation A to Military Supply ship Nation B (Custody transfer point at the delivery point of BFI Nation A).

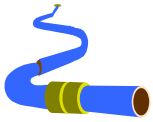
NAVAL Fuels: F-75/F-76				
  				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1) (3)**	**Reception tank**
• **Type C** on in-line sample at the loading point prior to each convoy/train and after change of feed tank. • Check certificate of analysis (**Type C+** or **B1** or **B2**) from the issuing tank.	**Intentionally Blank**		• **Type C+** on 1 representative sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis (**Type C+** or **B1** or **B2**) from the issuing tank.	• **Type C+** on all level sample taken in every reception tank after settling time (non-dedicated means only or doubt on the dedication).
• **Type C** on in-line sample at the delivery point of the issuing depot. • **Type B1** on in-line sample at the delivery point of issuing	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis (**Type C+** or **B1** or **B2**) from the issuing tank.	• **Type C+** on all level sample taken in every reception tank after settling time (NPS and Multi-products system only).

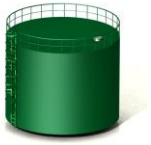
NAVAL Fuels: F-75/F-76				
  				
DEPARTURE			**ARRIVAL**	
Before loading (2)	**After loading**	**Means of transportation**	**Before unloading (1) (3)**	**Reception tank**
• **Type C** on in-line sample.	**Intentionally Blank**		• **Type C+** on 1 representative sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier.	• **Type C+** on all level sample taken in every reception tank after settling time.

(1) The density, corrected to 15°C, measured during the type C+ analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, the product shall not be discharged until the discrepancy has been resolved to the customer's satisfaction
(2) The type C analysis shall be performed by Nation A.
(3) The Type C+ analysis shall be performed by Nation A or Nation B (as per agreement between the two parties) in the presence of each party's representatives.

Table 4-34 (Concluded)

Table 4-35: BFI Nation A to Military War ship Nation B (Custody transfer point at the delivery point of BFI Nation A).

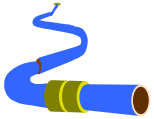
NAVAL Fuels: F-75/F-76				
  				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1) (2)**	**Reception tank**
• **Type C+** on in-line sample at the loading point prior to each convoy/train and after change of feed tank. • Check certificate of analysis **(Type C+** or **B1** or **B2**) from the issuing tank.	**Intentionally Blank**		• **Type C+** on 1 representative sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis (**Type C+** or **B1** or **B2**) from the issuing tank.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.
• **Type C+** on in-line sample at the delivery point of issuing	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis (**Type C+** or **B1** or **B2**) from the issuing tank.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.

NAVAL Fuels: F-75/F-76				
  				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1) (2)**	**Reception tank**
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C+** on 1 representative sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier.	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.

(1) The density, corrected to 15°C, measured during the type C+ analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, the product shall not be discharged until the discrepancy has been resolved to the customer's satisfaction
(2) The Type C+ analysis shall be performed by Nation A or Nation B (as per agreement between the two parties) in the presence of each party's representatives.

Table 4-35 (Concluded)

Table 4-36: BFI Nation A to Military Supply ship Nation B (Custody transfer point at the military Supply ship).

NAVAL Fuels: F-75/F-76				
Each batch issued from a BFI shall have been subjected to a **Type A** or **a Type B1 or a Type B2**.    				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1) (2)**	**Reception tank**
• **Type C+** on in-line sample at the loading point prior to each convoy/train and after change of feed tank. • Check certificate of analysis (Type A or B1 or B2) from the issuing tank.	**Intentionally Blank**		• **Type C+** on 1 representative sample (all levels or drain) for each compartment of the mean of transportation. • Check certificate of analysis (Type C+ or B1 or B2) from the issuing tank.	• **Type C+** on all level sample taken in every reception tank after settling time (non-dedicated means only or doubt on the dedication). • .
• **Type C+** on in-line sample at the delivery point of issuing	**Intentionally Blank**		• **Type C+** on in-line sample. • Check certificate of analysis (Type C+ or B1 or B2) from the issuing tank.	• **Type C+** on all level sample taken in every reception tank after settling time (NPS and Multi-products system only). •

NAVAL Fuels: F-75/F-76				
Each batch issued from a BFI shall have been subjected to a **Type A** or **a Type B1 or a Type B2**.    				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading (1) (2)**	**Reception tank**
• **Type C+** on in-line sample.	**Intentionally Blank**		• **Type C+** on 1 representative sample for each compartment. • Each cargo compartment is to be sounded for water using water-finding paste. • Check certificate of analysis issued by the supplier.	• **Type C+** on all level sample taken in every reception tank after settling time.

(1) The density, corrected to 15°C, measured during the type C+ analysis is to be compared with the density mentioned in the supplier certificate. If the difference between the two figures is above 3 kg/m^3, the product shall not be discharged until the discrepancy has been resolved to the customer's satisfaction
(2) The Type C+ analysis shall be performed by Nation A or Nation B (as per agreement between the two parties) in the presence of each party's representatives.

Table 4-36 (Concluded)

Table 4-37: Supply ship to War ship

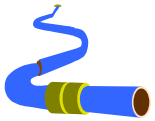
NAVAL Fuels: F-75/F-76				
				
DEPARTURE			**ARRIVAL**	
Before loading	**After loading**	**Means of transportation**	**Before unloading**	**Reception tank**
Type C+ on in-line sample.	**Intentionally Blank**		**Intentionally Blank**	• **National standard or minimum Type C+** on all level sample taken in every reception tank after settling time.

Table 4-37 (Concluded)

SECTION 5 QUALITY CONTROL PROCEDURES IN COMPROMISED CIRCUMSTANCES

0501. **Definition.**

a. The notion of a "Compromised Circumstance" applies to any situation in which it is not practicable to undertake or complete the level of analysis normally made in a laboratory, required in support of the routine procedures of quality control.

b. Such conditions may be encountered during a nations undertakings either at home or whilst on deployment within the framework of operations, exercises or normal activities. The following paragraphs offer a guide to the various means which may be implemented in compromised circumstances, so that as far as is feasibly possible routine procedures as defined in this STANAG can be met. Criteria, with which the relevant authority is to rely on to grant the authorisation to operate fuels under these conditions, are also described.

0502. **Absence of any Means of Analysis.**

a. Only under extreme operational circumstances should fuel that has not been tested in accordance with the requirements of Section 2 be used. Fuel is an important enabler and failure to meet a certain degree of quality may jeopardise the successful operation of equipment.

b. Authorisation to use fuel that has not been subjected to the correct level of analysis is only to be given by exception and then only to meet operational needs by the relevant authority as defined in Section 0104. The use of uncertificated fuel shall only be permitted following an evidenced based analysis of the products traceability relating to previous quality history and experience in relation to the quality of product normally seen at the location including any potential issues associated with the supply chain. The use of uncertificated fuel shall be notified to all users.

0503. **Incomplete Means of Analysis.**

a. Under certain circumstances it may not be possible to carry out the full level of analysis as required by Section 2. This may be due to a number of factors such as equipment failure or an incomplete testing facility being available at the location in which the analysis is taking place. As a consequence it is only possible to provide partial information on the quality of the fuel.

b. Authorisation to use fuel that has only been partially tested must be conducted on an evidenced based risk assessment by the relevant technical authority as defined in Section 0104. Factors that shall be considered, but not limited to when making any assessment on fuel quality are the extent of analysis conducted, traceability of the products previous quality history and previous experience in relation to the quality of product normally seen at the location including any potential issues associated with the supply chain.

0504. **Field Analysis Means**.

a. Field laboratories

Some nations and commercial companies provide portable field laboratories for the analysis of fuels. These may take the form of being incorporated into an ISO container or be capable of being assembled from their transportation cases in any location such as a military vehicle or tent. In the majority of instances they contain equipment capable of providing a 'B' type analysis and in some cases, they may even be capable of being able to provide a full type 'A' service. It should also be noted that in some cases the instruments available are of a scaled down type (i.e. micro) to that normally experienced in a laboratory. These instruments will have been chosen based on their ability to mimic the full scale test methodology and whilst would not be considered for use in a full scale certification laboratory have been deemed adequate for the work to be completed.

b. Other means of analysis

Decision making tools (examples being near-infrared or gas chromatography analytical processes) comprise equipment for determining a limited number of characteristics relative to the nature of the fuel and its quality. Knowledge of how these systems work and the level of their ability must be known before any decision can be made on the information they provide. Data produced in this way, shall be supported further with additional evidence. This shall include, although not limited to an understanding of the assessment undertaken on fuel quality;

b.1. the extent of analysis conducted

b.2. traceability of the products

b.3. previous quality history and experience from the source of supply and the supply chain

c. Validity of results

c.1. The results obtained using non standardised laboratory methods shall not be used in cases of dispute.

c.2. It is the responsibility of the relevant authority to estimate the degree of reliability of these means and to decide to use them.

0505. **Decision of Fuel Use.**

a. When operating under compromised circumstances decision shall only be made by qualified personnel as identified in Section 0104. Any such decision shall be based on the following;

a.1. Partial results of analysis, when they exist, obtained with standardised methods or decision-making tools.

a.2. Degree of reliability of the implemented means of analyses.

a.3. The document attesting to the quality of the product, when it was contained in the

upstream storage capacity.

a.4. Results of type-C or C+ analysis which must be conducted systematically by operators prior to any receiving operation.

a.5. The reliability of upstream logistical means (dedicated logistics or not, cleanliness of transportation means, degree of confidence in civilian operators/civilian means, etc.)

a.6. The volume of fuel is to be verified and compared to the original loading document where available.

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SECTION 6 HANDLING AND SAMPLING FUEL IN PACKED CONTAINERS

0601. General Precautions.

a. When filling or emptying an approved container, care is to be taken that all equipment used is clean, and that adequate precautions are taken to ensure that foreign matter does not enter the container.

b. When filling a drum by hose, the hose nozzle is to be bonded to the drum and splash filling is to be minimised as much as is feasibly possible. Splash filling can lead to the build up of static electricity in fuels that have poor static dissipation and can result in an explosion if suitable precautions are not taken.

c. Ensure that both bungs are open to allow air venting. Filling rates shall not exceed that requirement stated in API 2003 standard. If additives such as FSII and SDA are introduced, ensure that the concentration meets the product specification requirements.

d. Fuel stored in packed containers is susceptible to contamination from rust particles and water. Provided reasonable care is taken to ensure the removal of any water and rust particles prior to removing the fuel from the drums no serious defects are normally found in the operating efficiency of the fuel.

e. New, small, collapsible containers, e.g. “sealed drums” should not be used for the long term storage of aviation fuels unless previously soaked with the desired product for at least 24 hours, drained and then refilled.

0602. Marking of Containers

Minimum Container Markings for Packed Fuels

a. It is essential that containers for fuels are marked so that;

a.1 The product they hold may be readily identified in national and NATO supply systems.

a.2 The origin and age of the product may be established at any time.
a.3 The hazards associated with the product e.g. flammable, toxic or corrosive, are clearly indicated.

b. The following common markings are the minimum to be applied to all fuels packed in main base areas or manufacturers’ works and, where possible, to products packed in the field:

b.1 NATO Marking (NATO code number in accordance with STANAG 1135 enclosed by a rectangle).

b.2 Nomenclature (product description).

b.3 * Batch number.

b.4 * Filling date (month and year).

b.5 * Contract No, or Contractor's name (or initials).

b.6 Particulars of weight or volume of contents.

b.7 Health and safety and Transportation Dangerous Goods information in accordance with (inter) national regulations. Where applicable, use of the Global Harmonised System (GHS) shall be made.

b.8 Re-inspect date.

NOTE: * these markings may be in the form of a national code, if so desired.

c. The minimum common marking for products packed in reusable containers (e.g. Jerricans), in the field is the NATO marking. Additionally, the marking is to be in a position such that the NATO code number is readily seen when the containers are stacked. Where products are packed in outer containers such as boxes or cartons these minimum markings are also to be included in the markings placed on the outer container.

d. When used or new containers are filled in the field, all old markings shall be completely obliterated, and the container thoroughly cleaned before being filling. The filled containers are to be marked as indicated above.

0603. **Drum Capacity**

The nominal capacity of a drum is 205 litres; however, to allow for thermal expansion an adequate ullage space in the drum shall be provided by only partially filling and shall be dictated by (inter) national regulations. Observance of the conditions at the intended final point of use should also be considered.

0604. Fuel in Drums/Containers

a. Some locations will receive fuel in drums to meet operational needs and may even keep it stored in these packages for some months. When fuel is so received and stored, it is to be used on a “first-in-first-out” basis with regard to date of fill/batch number to minimize shelf-life and to prevent product deterioration.

b. Drums containing fuel should be inspected immediately upon receipt. Those received with broken seals or any bung leaks, shall be set aside and checked for mishandling or contamination. Containers found leaking in any part other than at a bung must be emptied at once through a filter into an intermediate storage tank (this may be another drum filled in accordance with 2 above). When the possibility of contamination in connection with bung leaks, or packages received with broken seals has been eliminated as a result of an investigation, these containers, too, should be emptied at the earliest opportunity.

c. A record is to be kept of the information noted on the package, including the new markings, the date of receipt, and the source of supply. In the event of any signs deterioration being noted on the testing of a sample, this information will aid in the tracking of stock of the same batch and source. This will permit arrangements being made for the early use or disposal of the entire batch. The record is to be kept for a minimum of two years or until the batch is consumed, whichever is the longer.

d. Before opening a drum, the bungs and top surface are to be carefully wiped clean. After the drums have been placed in the correct orientation, a bung wrench is to be used to remove the bungs.

e. Immediately after drums have been emptied, the bungs must be carefully cleaned and replaced in the drum to prevent the escape of fuel vapours and to safeguard against the accumulation of moisture and foreign substances inside the drum. The bung must be screwed in tightly using a new gasket when available. If new gaskets are not available, care must be taken to preserve the old gasket for this purpose. When screwing in the bungs, care must be taken to avoid the stripping of the threads. The empty drums must be promptly removed from the immediate vicinity.

0605. Container Storage

a. Whenever possible, containers should be stored under cover, in a cool place where air is permitted to circulate.

b. 25 litre drums.

b.1. Indoors. Stacked upright with each tier inset half a drum (Figure 1).
Where the design of the drum makes this method impracticable, the drums are to be stacked immediately on top of each other. The height is not to exceed 5 tiers.

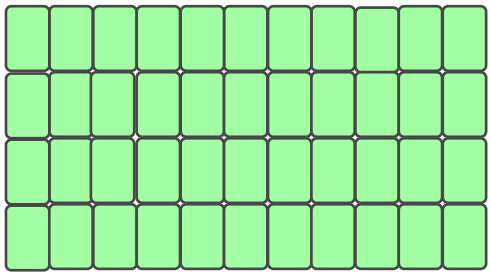

FIGURE 1 SHOWING STACKED 25 LITRE CONTAINERS

b.2 Outdoors. Belly stack in rows of 2 butt to butt and up to 5 tiers high (Figure 2). Filler caps are to face outwards just below the liquid level in the drums. Bungs are to be inspected before stacking. A lane 2 m wide is to be left between each double row.

FIGURE 2 SHOWING BELLY STACKED CONTAINERS

FIGURE 3 200 LITRE DRUM PREPARED FOR SAMPLING

c. Large Drums in Excess of 25 Litres.

c.1. They should be stored either upright or 'belly stacked' on their side (Figure 2 and 3). When belly stacked bungs shall be in a horizontal position so leaks may be detected and/or eliminated (that is at the 3 o'clock and 9 o'clock positions) with the bung seals immersed in the fuel. If stored upright the drums must be covered to prevent water contamination or must be slightly slanted to keep water from covering the bungs, see figures 1 and 2. If stored on a concrete floor, the floor should be sloped to permit controlled and contained drainage.

c.2. Where it is necessary to store drums in the open, they are to be arranged in rows of 2, butt to butt, with the end bungs outward. Normally they should be stored 1 tier high but if real estate does not permit this then 3 tiers is acceptable in groups totalling no more than 50 drums. Ensure drums are stored on hard dry standings otherwise their weight will cause them to sink, and rust will form. Each group shall only include drums of the same batch.

d. Jerricans.

d.1. These are to be stored where possible upright to avoid leakage from closures. Jerricans can be stacked up to 4 tiers high but where real estate permits, 2 tiers upright should be provided for ease of working and extraction of leakers. On uneven ground belly stacking may prove necessary (Figure 4) and if this is the case then closures are to be uppermost. Jerricans can be belly stacked up to 10 tiers high.

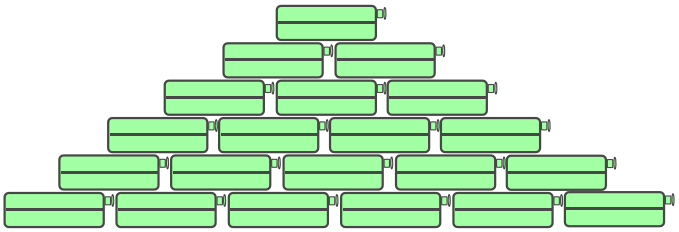

FIGURE 4 SHOWING BELLY STACKED JERRICANS

e. Jerricans shall not, under normal circumstances, be used for the storage of aviation fuels.

f. In the selection of the container storage site and the method of storage at units, consideration must be given to accessibility, environment, protection against fire and theft, as well as the protection of containers from corrosion and rust.

0606. Quality Control

a. Every 12 months after the filling date, a representative sample from each batch shall be sent to a laboratory for testing to verify that the fuel continues to conform to its specification.

b. When sampling from more than one aviation fuel containers, a representative, composite sample shall be drawn from each individual batch. One in 10 containers shall be sampled (e.g., if there are 8 drums in stock, 1 shall be sampled; if there are 45 drums, 5 samples shall be taken and a composite of equal parts of these shall be made).

c. It is not permissible to mix samples from different batches in the preparation of a composite.

d. If the test results are within specification limits and show no change in comparison with the original test certificate or STANAG 1110, the fuel may be kept for an additional 12 months. If acceptable deterioration is noted this fuel shall be used in priority over all other stocks. Records shall be maintained indicating the test results and the fuels new re-test date. Records are to be kept for a minimum of two years. Fuel no longer meeting specification shall be either downgraded or disposed of in accordance with applicable regulations and the original drum markings shall be changed accordingly.

0607. **Sampling Fuels from Containers**

a. Prior to drawing a sample from a container, where feasible the container shall be placed in a tilted position on a support block so that the large bung is in the uppermost position for a minimum of 10 min to allow the contents to settle (Figure 3).

b. To take a sample, first remove the bung and place it beside the bunghole, with the wet side up. Then flush a clean and dry glass sampling thief or bonded metal tube with the product to be sampled by following the procedure below;

   b.1. Insert the open end (lower) of the clean, dry glass thief or bonded metal tube into the fluid to be sampled to a depth of approximately 150 mm (6 in), with the opposite (upper) end closed.

   b.2. Open the upper end by removing the obstruction and allow the liquid to flow into the tube.

   b.3. Close the upper end and withdrawing the glass thief or bonded metal tube.

   b.4. Flush the glass thief or bonded metal tube by holding it horizontally and turning it to ensure that the liquid makes contact with the entire inner surface.

   b.5. Drain and dispose of the rinsing fluid in an acceptable manner.

   Note: Handling any part of the tube that will be immersed in the fuel during the sampling operation should be avoided.

c. To draw a representative sample (e.g. for a retest sample), lower the freshly prepared glass thief or bonded metal sampling tube into the fuel, with the upper end open, at such a rate that the level of the liquid inside the tube is approximately even with the level outside, so that the full depth of liquid is sampled. Place a thumb on the open end, quickly withdraw the tube, and transfer the contents to the prepared sample container. Repeat until the required volume has been withdrawn taking care not to disturb the fuel in the drum as much as possible.

d. To draw a bottom sample, lower the freshly prepared glass thief or bonded metal tube into the fuel, with the upper end closed with a bung or your thumb. When the tube reaches the bottom, remove the bung/thumb and allow the tube to fill. Close the open end with the bung or thumb, and quickly withdraw the tube and transfer the contents to the sample container.

Repeat until the required volume has been withdrawn taking care not to disturb the fuel in the drum as much as possible.

0608. Water in Fuel

a. All fuel obtained in drums is to be suspected of being contaminated with water. Water detection tests are to be carried out using a chemical test kit such as the Shell Water Detection capsule, Hydrokit or Aqua-glo on a bottom sample.

b. If free water is detected it should be removed by means of a sample tube or a drum thief. If this equipment is not available special care must be exercised when removing the fuel from the drum (for example, tilt the drum so that the water will gather away from the area where the pump standpipe will be, or keep the standpipe at least 5 cm (2 in.) from the bottom of the water level). Alternatively, the drum can be marked as being contaminated and the fuel disposed of in accordance with applicable regulations.

c. Regardless of the type of pump to be used (hand operated or electric) to deliver fuel from the drum to the aircraft, the fuel must pass through an approved Filter Water Separator prior to entering the aircraft fuel tank. The standpipe of the pump shall have a diagonal cut-away at the bottom to ensure that suction is lost before the drum is completely empty.

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SECTION 7 CLEANLINESS REQUIREMENTS

CONTENTS

0701. **General**

Cleanliness is essential throughout the Fuel Supply Chain. Failure to meet the requirements in this Section may have a serious impact on fuel quality. In general the requirements for aviation fuel are the most severe compared with those for ground and naval fuels. As one of the aviation fuels covered in this document is intended for use on board of aircraft carrying ships, one must take into account that the term "air bases" used in this STANAG includes aircraft carriers and any other ships designed or adapted to carry and refuel aircraft.

0702. **Tankage**

a. Before any internal coating or protective treatment is used in any tank, the qualified national authorities must approve its suitability for use with the products stored in the tank, also in the case that, deliberately or not deliberately, freshwater or seawater is present at the same time.

b. All new and replacement storage tanks delivering jet fuel to airbases by truck, train or pipeline, other than those constructed of non-corrodible material, shall be internally coated.

c. This coating must be approved by the qualified national authorities for use with the products stored in the tank, also in the case that, deliberately or not, freshwater or seawater is present at the same time.

c.1 In cases where uncoated tanks are in use and are likely to remain in use at an airbase, they should be internally coated as opportunity permits.

d. All fuel tankage that has been cleaned, or that is newly installed, shall be flushed and/or soaked, to ascertain that all cleaning/build materials have been removed and that any newly applied lining has cured and are now suitable for receiving and storage of product without having a detrimental effect on product quality. Sampling and testing of fuel is required prior to commissioning newly installed tanks or bladders. The required testing level is a B2 test for all products plus an MSEP for F-35.

e. Internal Preservation. In any fuel installation likely to be out of service for 4 months or more, pumps, fans, motors etc are to be given adequate protection, either in situ or by transferring to storage. All tanks shall be isolated, cleaned, and dried. Additionally:

e.1 Aviation fuel tanks have to be sealed.

e.2 Water-displacing fluids shall not be used for the internal protection of aviation fuel tanks, as they are difficult to remove completely and will affect the fuels natural ability to separate water.

e.3 All other tanks shall be protected internally with a suitable water displacing fluid.

f. Due to the adverse effect on fuel quality the use of Zinc, Cadmium and Copper Compounds are prohibited for use with aviation fuel systems and sampling equipment. The internal protection of pipelines, storage tanks and other equipment used for aviation fuels, with protective treatments containing zinc is prohibited.

f.1 Zinc chromate can be used as a primer provided that it is overcoated with an approved epoxy finish coat.

f.2 The use of copper and copper alloys are prohibited, select materials such as stainless steel.

g. Railcars, (road) truck tanks and refuelling vehicle tanks shall be made of corrosion resistant materials or mild steel internally coated with a material approved by the national authority. All types of vehicles and tanks are to be kept dedicated to one product wherever possible. Where this is not possible the appropriate change of grade procedures as identified in Table 7-2 shall be followed before filling the vehicle/tank with the new product to be carried. In addition the following should be maintained:

g.1 Blanking caps are to be fitted to all filling and discharge connections when not in use.

g.2 Domes of railcars and all tank vehicles are to be secured and sealed immediately after filling.

g.3 Prior to discharge into storage, a settling time of 20 minutes is to be imposed before the quality of the consignment is to be checked (see Table 7-1)

h. Tanks of all vehicles and railcars are to be inspected internally at intervals not exceeding 24 months. In cases where legal requirements require a more frequent periodicity of inspection, then these shall prevail. They are to be cleaned internally as necessary, and in the case of internally protected tanks, any defects in the protective lining are to be remedied immediately.

i. Water removal. A suitable means of removal of accumulated water is to be provided in any tankage construction, whether fixed or deployable. Unless specifically authorised by the appropriate authority, the use of water bottoms is prohibited for the storage of aviation fuels.

j. Tanks containing static stocks should be checked for presence of free bottom water at least weekly and any water found should be removed immediately. Proper draining is essential to maintain the cleanliness and the quality of all fuels.

k. Any water that cannot be removed by routinely draining should be sampled and examined visually for evidence of microbiological activity. The presence of slime at the water interface or cloudiness should be investigated to establish whether microbiological organisms are present. If microbiological activity is confirmed, action shall be taken in accordance with STANAG 7063 to eradicate the problem and with appropriate notification of military authorities.

l. In all cases, excess water shall in all cases be drawn off before any fuel transfer.

m. Tank cleaning. Tankage shall be cleaned when there is evidence from product samples, internal inspections or sludge tests, that a tank is excessively dirty with rust or sludge. The cleaning of tanks as part of a planned inspection scheme, to ascertain the mechanical integrity of the tank, is specified by STANAG 3609.

0703. **Segregation**

a. All products are to be positively segregated from one another and all issues shall be made through a segregated system. Segregation of approved products is to be by positive means, e.g. a blank flange, spectacle plate, spool piece or double valve with an open drain. Segregation by a single valve only is prohibited.

b. Whenever possible, bulk storage tanks are to be used for one product only. Where it is necessary to change the use of a tank from one product to another the appropriate change of grade procedures as identified in Table 7-2 shall be followed.

0704. **Settling Time**

a. After receipt of fresh stocks, the maximum practicable settling time should be allowed in bulk storage tankages, in order to permit settlement of water and solid matter.

Minimum settling period for gasolines (aviation and automotive):	1.5 hours per metre
Minimum settling period for aviation turbine fuels:	3.0 hours per metre

Minimum settling period after bunkering for all fuels aboard ship:	24 hours

b. Where systems are constructed to prevent the introduction of contaminants into or the formation of contaminants within the system, the settling time may be reduced to a total of 2 hours for the entire tank contents before issues can be made. In this type of design, fuel shall enter the storage tank through filter separators, all internal surfaces of pipelines and tanks shall be constructed from non-corrodible materials and the system is equipped with continuous quality monitors. In case no continuous quality monitors are present, separate sampling and analysis of the sample is required before issues can be made.

0705. **Pipelines and Pipeline Transfers**

a. Pipeline Condition Checks. Pipelines should be kept clean by pig cleaning or other suitable means. The internal condition of the pipelines should be monitored and checked by testing product samples, by examining spool pieces, or by periodic evaluation of statistical data.

b. 'Pumping procedures. The highest safe and practical pumping rate throughput shall be adopted. Adequate measures to prevent electrostatic discharge hazards shall be taken. In all events the following shall be observed:

b.1 The product must be moved at turbulent flow rate.

b.2 Pumping interruptions and variations in the throughput rate, shall be limited as far as is practically possible.

b.3 The pipeline shall whenever practicable be kept full of product and be maintained under pressure.

c. Multi-Product Operations. During multi-product operations the following steps shall be taken:

c.1 Pumping is to be continuous whenever possible, up to the moment when only one fuel type is left in the line between block valves or depots.

c.2 The progress of the interface in the pipeline shall be followed carefully so that the receiving depot or installation can be informed in sufficient time of the arrival of the interface.

c.3 The arrival of the interface shall be carefully monitored. Only pure product cuts shall be made, except in a situation as described in the next line.

c.4 The interface shall be received into an interface tank unless previously approved procedures permit disposal through direct injection into a lower grade product with the assurance that the resultant mixture will be within the applicable product specification or authorised control limits.

c.5 Re-injection of the interface into product shall be carried out only when a pumping operation is in progress and under laboratory control.

c.6 Re-injection of interfacial mixtures shall not be made into fuel being delivered directly to users and shall not be made into aviation grade fuel.

c.7 Specific caution is brought to avoid any cross-contamination: control of the valves, installation of double bleed valves, flushing of the dead legs, etc.

c.8 Special attention is required for pumping fuel with polar bio-components, such as Fatty Acid Methyl Esters (FAME). The polar nature of the bio-component adheres to the pipeline material and causes a forward creep and a backward tailing of contaminant. Because of the extremely low, maximum amounts of bio-components that are permitted as a contaminant (especially in aviation fuels), a thorough evaluation must be made of the complete product transfer and dispensing system, which shall include connected non-segregated manifolds. Further information on the processes for the handling of aviation fuels in multiproduct systems can be found in bulletins 37, 61 and 75 issued by the Joint Inspection Group that may be found at www.jigonline.com.

c.9 The pumping of gasoline containing ethanol requires special attention to prevent contamination of other products.

0706. **Hoses**

a. To keep systems clean, all hoses that are not in use must be blanked.

b. Aviation Refuelling Hoses shall comply with STANAG 7029. Hoses shall be used within 2 years of their cure date or date of manufacture and shall be in-service for a maximum of 5 years for refuelling vehicles and a maximum of 10 years on loading fill stands.

c. Refuelling hoses must be flushed in the following situations:

c.1 New Hoses. Before use of a new or re-issued hose, it shall be filled with the appropriate grade of fuel and left to soak for a minimum of 8 hours at a temperature of 15°C or higher before flushing with at least 2,000 litres of the fuel to be transferred. Longer soak times are required where the fuel temperatures are lower. After flushing take a one-litre sample and examine the fuel visually for excessive discoloration or solids. If the sample indicates contamination, internally soak the hose for a further three hours, flush with at least 2,000 litres of the fuel for which the hose will be used. After flushing take another sample and examine for contamination. Failure will require additional internal fuel soaking until the sample is free of contamination.

c.2 Hoses on aircraft refuelling equipment which have not been used for 7 days or more shall be flushed prior to refuelling an aircraft with a volume of fuel not less than 3 times the content of the hose.

c.3 All hoses: shall be kept under observation during the refuelling operation. If a weakness or defect is observed, the refuelling operation is to cease immediately and shall not continue until the hose is replaced.

c.4 Other hoses: in any case where contamination is suspected, for example due to improper storage, the hose(s) must be flushed with a quantity of fuel equal to not less than 3 times the volume of the hose.

0707. **Critical Contamination Factors**

Table 7-1 outlines the major areas of concern that shall be considered when fuels are received from systems that have been subjected to change of grade procedures in relation to the previous cargoes carried.

Next Cargo	Critical Properties / Contamination
AVIATION GASOLINE	See also the critical factors affecting Ground Use Gasoline **Where the last cargo carried is ground use gasoline**: Oxygenates like alcohols and ethers (like MTBE and ETBE), that generally occur in this gasoline are critical contaminations.
GROUND USE GASOLINE (Lead free, low Sulphur)	Water Sulphur from any aviation grade Lead from aviation gasoline's **Where the last cargo carried was Dyed Kerosene**: Some commercial kerosene's are powder-dyed after loading. Dye powder can adhere to bulkheads and become impregnated in scale above the liquid level. This may subsequently cause white products to not meet specification requirements with respect to colour. **Where the last cargo carried was either a Distillate fuel, residual fuel, lube oil or any vegetable or animal oil**: As little as 50 litres of any of these fuels can contaminate up to 1300 m^3 of gasoline by increasing gum content.
KEROSENE (heating oil)	**Where the last cargo carried was Gasoline**: Small quantities of any gasoline will diminish the flash point rendering it off specification. **Where the last cargo carried was Dyed Kerosene**: Some commercial kerosene's are powder-dyed after loading. Dye powder can adhere to bulkheads and become impregnated in scale above the liquid level. This may subsequently cause white products to not meet specification requirements with respect to colour. **Where the last cargo was Residual fuel:** Very small quantities of this fuel will cause white products to not meet specification requirements with respect to colour.

Table 7-1 (Concluded on page 7-8)

Next Cargo	Critical Properties / Contamination
AVIATION TURBINE FUEL	Water **Where the last cargo carried was Gasoline**: Small quantities of all gasoline's (ground use and aviation) will cause the flash point, distillation IBP and explosivity of most aviation turbine fuels to not meet specification requirements (only the flashpoint of wide cut aviation turbine fuel will remain unaffected). Lead, a common component in aviation gasoline's, is detrimental to all aviation turbine fuels. **Where the last cargo carried was Ground diesel fuel or Distillate Fuel:** Small quantities of these fuels will cause these products to not meet specification requirements with respect to freezing point. Other parameters that are susceptible are JFTOT, MSep, distillation FBP and existent gum. Where these fuels contain bio-components such as FAMEconsideration ust be provided to ensure FAME contamination level does not exceed the current 50ppm limit. . **Residual Fuel**: Small quantities of residual fuel will cause these products to not meet specification requirements with respect to gum content.
HIGH FLASHPOINT AVIATION TURBINE FUEL	See also the critical factors affecting Aviation Turbine Fuel. **Where the last cargo carried was wide cut aviation turbine kerosene (F-40) or Aviation Turbine Fuel (F-34 / F-35)**: Small quantities of these aviation grades will cause this product to not meet specification requirements for flashpoint.
DISTILLATE FUEL (ground use diesel, marine diesel fuel, gasoil)	Water **Where the last cargo carried was any gasoline:** Small quantities of any gasoline will cause this product to not meet specification requirements for flashpoint. **Where the last cargo carried was aviation gasoline:** Lead, a common component in aviation gasoline's, is detrimental to all distillate fuels. **Where the last cargo carried was wide cut aviation turbine kerosene ~~and~~ or Aviation Turbine Fuel or heating kerosene**: Small quantities of these aviation grades may cause distillate fuels to not meet specification requirements for flashpoint. However, high flash point aviation turbine kerosene F-44 will not affect the flashpoint of F-54 / F-75 / F-76.

Table 7-1 (Concluded on page 7-8)

Next Cargo	Critical Properties / Contamination
DISTILLATE FUEL (ground use diesel, marine diesel fuel, gasoil) continued.	**Where the last cargo carried was any Aviation Turbine Fuel :** The Sulphur content of Low Sulphur distillate fuels may be affected by all Aviation Turbine Fuels, depending on their Sulphur content, which may be up to 3000 ppm **Where the last cargo carried was Residual Fuel:** Small quantities of some residual fuels will precipitate sludge in distillate fuels. Small traces of residual fuel will reduce the water separability of distillate fuels.

Table 7-1 (Concluded)

0708. **Change of Grade**

a. The following tables outline the minimum actions to be taken when the grade of product either stored or transported is changed to another grade. Care must always be taken to ensure that following any such action the quality of the new product either stored or transported is not adversely affected in anyway.

b. The tables will deal with the change of grade for:

b.1 Fixed, deployable and mobile storage in relation to Military Fuels

b.2 Waterborne transport, (tankers, barges and small vessels)

b.3 Dispensers and hydrant systems

c. F-18, aviation gasoline containing lead shall only be stored as packed product and not in bulk storage. In instances where F-18 is transported and/or stored in bulk, in accordance with STANAG 4786, the national technical authority must evaluate all aspects of the cleanliness requirements and must issue instructions on the cleanliness measures that are to be taken. In cases of multi-national cooperation, these measures shall be made available to all partner nations concerned, so that a decision can be made on whether these requirements fulfil the demands of all those involved.

d. F-37 is a thermally stable aviation turbine fuel prepared by the addition of a further additive to F-34. In the main, F-37 will not be encountered during multi-national operations. However, if it becomes necessary to defuel aircraft fuelled with F-37 every effort shall be made to return the fuel directly to the original aircraft or another aircraft capable of using this fuel grade. If this is not possible then it may be diluted in either F-34 or F-35 provided that the volume of F-37 does not exceed 1% of the total bulk fuel volume.

Previous stored product ⇓ / New military grade product to be stored ⇒	Non- Leaded Gasoline F-67	Turbine Fuel Aviation (Kerosene Type) F-35 F-34	Turbine Fuel Aviation (High Flash Point Kerosene Type) F-44	Turbine Fuel Aviation (Wide Cut Kerosene Type) F-40	Heating Kerosene F-58	Diesel Fuel F-54	Diesel Engine Fuel Kerosene type F-63	Naval Distillate Fuel F-75 F-76
Non-Leaded Gasoline F-67		tanks and railcars : II roadtankers and refuelling vehicles and bladders: see Note 1	tanks and railcars : II roadtankers and refuelling vehicles and bladders: see Note 1	tanks and railcars : I roadtankers and refuelling vehicles and bladders : see Note 1	II	II	II	II
Turbine Fuel Aviation Kerosene Type F-35 and F-34	II		II	I	I	II	I	II
Turbine Fuel Aviation High Flash Point Kerosene Type F-44	II	I		I	I	I	I	I
Turbine Fuel Aviation Wide Cut Type F-40	II	II	II		II	II	II	II
Kerosene (heating), undyed F-58 without bio-components	II	I	II	I		I	I	I

Previous stored product ⇓	New military grade product to be stored ⇒	Non- Leaded Gasoline F-67	Turbine Fuel Aviation (Kerosene Type) F-35 F-34	Turbine Fuel Aviation (High Flash Point Kerosene Type) F-44	Turbine Fuel Aviation (Wide Cut Kerosene Type) F-40	Heating Kerosene F-58	Diesel Fuel F-54	Diesel Engine Fuel Kerosene type F-63	Naval Distillate Fuel F-75 F-76
Diesel fuel F-54		previous grade with < 15% biocomponent: I previous grade with >= 15% bio-component: II	Roadtankers and refuelling vehicles: IV Note 1 other storage media : III	Roadtankers and refuelling vehicles a: IV Note 1 other storage media : III	Roadtankers and refuelling vehicles: IV Note 1 other storage media : III	I		I	III
Diesel Engine Fuel – kerosene type F-63		I	II	II	II	I	I		III
Naval Distillate Fuel F-75 and F-76		I	II	II	II	I	I	I	

Table 7-2 (Concluded on page 7-13)

There is no change of grade. New loaded product can be filled in storage or transport medium on condition that multi-product loading arms have been flushed with the new product.

In all cases, tanks, lines etc. are to be drained to their fullest practicable extent.
When draining railcars and tank vehicles, attention should be given to sumps, pumps, filters, hoses and other components that are likely to trap quantities of liquids.
Loading arms that have previously carried any FAME (Fatty Acid Methyl Ester) containing biodiesel with up to 5% FAME shall have as a minimum at least one (1) non bio/FAME containing product passed through them prior to the loading of aviation grade fuel. In case of FAME content between 5 and 15%: at least three (3) non bio/FAME containing products as intermediate before loading of any aviation grade fuel. In case of FAME content of 15% or more, the installation is unsuitable for loading aviation grade fuels unless thorough cleaning plus three intermediate products are pumped through it.
Manifolds and cargo and/or tank lines shall be cleared as best as practicable

The following change of grade procedures are to be taken as a minimum:

I Drain previous grade as best as practicable, fill with desired grade

II Drain previous grade as best as practicable; flush with the grade to be loaded, drain, fill with new grade
In the case of large storage tanks flushing may be omitted. Draining shall be accomplished by main suction line, followed by further product removal through the water drain off point to remove the previous product as best as is practically possible. The decision on whether flushing or draining of large tanks must be taken is the responsibility of the Technical Authority and shall be documented. Documents shall be archived for a minimum of 5 years or at least 20 fillings with the new product.

III In cases where the previous grade was a fuel with a FAME content of < 15 weight%: at least one (1) intermediate filling with non-FAME containing grade is required, together with extra cleaning prior to the loading of jet-fuel
In cases where the previous grade was a fuel with a FAME content of >= 15 weight%: at least three (3) intermediate fillings with non-FAME containing grades are required, together with extra cleaning prior to loading of jet-fuel
Extra cleaning shall include, but not be limited to a hot water wash (50-60°C), cold water rinse, drain dry and mop.

IV Completely drain tanks, pipework, meters, pumps and filters, downgrading the drained product to non-aviation use. If applicable fill with a FAME free diesel or jet fuel defuelling and draining as above. Remove hoses that have been used with diesel fuel. Extra cleaning is required and shall include, but not be limited to, hot water wash (50-60 Deg C), cold water rinse, drain dry and mop. Partially fill with the grade to be loaded and leave to soak for a minimum of 10 mins before draining (downgrading to non-aviation use) ensuring the fuel system, including pipework, pumps etc are

	flushed and drained. Drain valves to be flushed and drained to ensure diesel removal from low points. Partially fill with fuel to be loaded and take samples from all fuel extraction points and drain valves for FAME content analysis. On validation of a successful cleaning procedure attach newhoses or hoses that have been used exclusively for jet fuel. Provided the FAME content is less than 50 mg/kg fill with jet fuel and submit a sample for B1 analysis including FAME content before refuelling commences.
Note 1	DEDICATED roadtankers and refuellers are the preferred option. Grade change from F-54 to Aviation Turbine Fuel is prohibited for bladders. In exceptional circumstances, change of grade is allowed provided procedure III or IV is carried out. The first cargo of aviation fuel shall be tested for FAME to validate the change of grade procedure.

Table 7-2 (Concluded)

e. For all situations (white to white or black to white products) that are not represented in Table 7-2 advice shall first be sort from the National Technical Authority before any change of grade is undertaken. The civilian document HM-50 will provide guidance on the cleanliness and cleaning requirements. The National Technical Authority though shall be the final arbiter in such situations. HM-50 is freely available from the internet at EI HM 50 , see Table 4 of this document for circumstances not covered Table 7-2.

0709. **Bulk Waterborne Transport**

a. This section deals with the transportation of fuels in ocean going cargo vessels, barges and small motor vessels. The term "tankers" when used in this section shall include ocean going and coastal tankers, barges, fleet replenishment vessels and refuelling crafts.

b. Tankers shall be used for one product unless the products carried can be contained in segregated tanks and segregated piping and (un)loading-system. A positive means of segregation is preferred in these multi product operations. However, if this is not available on the vessel, at least two valves should separate all systems containing different products. In circumstances where different product types are transported in the same tanker and the products are not subjected to positive segregation, each compartment is to be checked for contamination prior to off-loading. Piping and (un)loading systems have to be flushed thoroughly.

c. Fleet replenishment vessel delivery. Replenishment vessels shall take all possible steps to remove water from their cargoes. Non-aviation fuels delivered by fleet replenishment vessels shall be filtered in accordance with the standard for the particular product involved, as set forth in Section 8 (Filtration) unless the receiving ship waives these filtration requirements. Aviation fuels shall always be filtered in accordance with the standard for the particular product involved, as set forth in Section 8 (Filtration), an exemption is not allowed.

d. Aviation fuels shall only be transported in a vessel in which the tanks and auxiliary equipment such as pumps, loading arms etc, are dedicated to the transportation and transfer of these products.

e. In cases where it is unavoidable that aviation fuels are transported within a non-dedicated vessel, additional precautions have to be taken, with intermediate loads and cleaning operations, including the piping, pumping and (un-)loading systems, so as to prevent any deterioration of the aviation fuel carried.

f. In cases aviation fuel has to be transported in a vessel which has transported before either black products, chemicals, fuels with 15 wt% or more of bio-components, like FAME, Ethanol, Ethers or non-specified renewable fuel from vegetable or animal origin, or similar non-white fuels, at least three white intermediate cargo’s must have been transported after the last transport of one the previously mentioned non-white products and before the loading of any aviation fuel, and full attention must be paid to the cleaning actions that are necessary between the several loads. Especially polar bio-components like FAME

are very persistent and difficult to remove sufficiently to prevent contamination of aviation fuels.

g. In cases aviation fuel has to be transported in a vessel which has transported before any fuel with bio-components in a concentration of less than 15 wt%, at least one white intermediate cargo must have been transported between the fuel with bio-component and the aviation fuel. The other precautions of the paragraph above also apply.

h. If for the carriage of any military fuel a change of grade is necessary, the tanker shall be thoroughly cleaned to the standards set out in Table 7-3 of this Section. The standards in this Section are limited to military fuels. Table 7-3 is based on the commercial practices for similar civilian grades of fuels. These commercial practices are outlined in The Energy Institute document HM-50 “Guidelines for the cleaning of tanks and lines for marine tank vessels carrying petroleum and refined products”. HM-50 is available from the internet, EI HM 50 from the Energy Institute Publication website www.energyinst.org. For all other situations, best commercial practices from the HM-50 document shall be taken into account and advice sought from the National Technical Authority.

i. It is recognised that in some instances, machine washing may not be practicable or possible. In such cases, the National Technical Authority may permit cleaning by other methods which will render the equipment acceptable for the intended cargo.

j. Where the guidelines cannot be applied, transportation of the product(s) shall be considered as being compromised. In such an event controls before unloading have to be reinforced: control of all tanks and of the lines (Type A analysis). The National Technical Authority has to advise on measures to be taken.

	AVIATION GRADES				GROUND USE GRADES				NAVAL GRADES
NEW CARGO ⇒ LAST CARGO ⇓	F-18	F-34 / F-35	F-40	F-44	F-54 ultra low sulphur	F-58 undyed	F-63	F-67 ¶	F-75/ F-76
F-18	1	2PM	2M	2PM	2PM	2P	2PM	2PM	2P
F-34/F-35	2	1	1	2PM	2PM	1	1	2PM	2P
F-40	2	2PM	1	2PM	2PM	2P	2PM	2PM	2P
F-44	2	1	1	1	1	1	1	2PM	1
F-54 without FAME	2M	2M	2M	2M	1	1	1	1	1
F-54 with up to 5% FAME	3M	3M	3M	3M	1	1	1	1	1
F-54 with 5 to 15% FAME,	3M*	3M*	3M*	3M*	1	1	1	1	1
F-54 with 15% or more FAME	X*	X*	X*	X*	1	2	1	2	2
F-58 dyed	2M	1	1	2PM	2M	2	1	2PM	1
F-58 undyed	2M	1	1	2PM	1	1	1	1	1
F-63					2PM	1	1	2PM	2P
F-67 without Ethanol and without MTBE / ETBE †	1	2PM	2M	2PM	2PM	2P	2PM	1	2PM
F-67 with Ethanol or with MTBE / ETBE †	3	3PM	3M	3PM	2PM	2P	2PM	1	2PM
F-75/F-76 (without FAME), undyed	2M	2M	2M	2M	2PM	1	1	1	1

Table 7-3 TANKERS AND BARGES - CARGO TANKS CLEANING RECOMMENDATIONS (Concludes on page 7-16)

Explanation of codes:

X	Not to be loaded without special cleaning instructions.
X*	Not to be loaded without special cleaning instructions. Three clean product/zero biological content intermediate cargoes strongly recommended
1	Drain well. Inspect the tank coating. In cases where the tank coating exhibits evidence of deterioration (damaged coating or proven to have discoloured since previous cargo) then the procedure described under 2M shall be adopted.
2	Wash with cold sea water and drain well.
3	Wash with hot sea water and drain well
3M*	A stringent hot water wash, drain and mop may be sufficient if tanks are in good condition. As an alternative one clean product/zero biological content intermediate cargo is strongly recommended, followed by hot water wash, drain and mop. Fresh water rinse required if seawater is used.
P	Purge to below 2 vol-% hydrocarbons
M	Gas free, lift scale and mop
#	Fresh water rinse after any salt water wash when loading these products
†	Benzene may be present in any fuel but may be present in higher concentrations in products marked with †. Refer to ISGOTT for precautions in handling cargo suspected of having a benzene content and prior to entering a space which has contained such a cargo
Notes	- Additional cleaning may be required for tanks with extensive coating breakdown or where specified - In case the FAME content in diesel fuel is unknown, it has to be assumed to be 15% - Comments regarding FAME also apply to FAEE

Table 7-3 (Concluded)

0710. **Dispensers and Hydrant Systems**

a. Dispensers and hydrant systems are dedicated systems for one grade of fuel and especially those employed in the distribution of aviation fuels. A change of grade shall only occur as an exception and only undertaken if the change will be permanent or for a considerable period of time. The adhoc change of grade in aviation fuelling systems is not permitted.

b. Table 7-4 lists only the most likely changes. For changes that are not listed, advice shall be sort from the National Technical Authority on the appropriate actions to be taken to ensure that the new grade can be dispensed without risk of affecting product quality, reliability of equipment, safety, health and environmental requirements.

c. It is assumed that F-37 (F-34 plus an additional thermal stability additive) shall be blended at point of issue just before the skin of the aircraft and that this fuel is not present in any tank vehicle, dispenser or hydrant system.

Previous grade	New grade	Action
F-34	F-35	None
F-35	F-34	The filter system shall be suitable for the handling of fuels containing FSII. The use of fuel filter monitors is forbidden in the handling of F-34.
F-44	F-34 or F-35	None
F-34 or F-35	F-44	Drain as well as possible to prevent aviation turbine fuel F-34/F-35 from affecting the flash point of high flash kerosene type aviation turbine fuel.
F-40	F-34, F-35 or F-44	To prevent that wide cut F-40 is being transferred to an aircraft that uses aviation turbine fuel: 1. drain F-40 as well as possible 2. flush system with new grade, with a volume of at least three times the contents of the dispenser-system. At end of flushing process: take a sample of the flushing fluid and perform a flashpoint test. If flashpoint test fails the requirement, repeat flushing and testing process.
F-34, F-35 or F-44	F-40	Drain as well as possible

Table 7-4 (Concluded)

SECTION 8 FILTRATION

0801. **General**

a. During fuel transfers within the supply chain and on transfer to equipment, a suitable means of filtration, or combination of filtration and electronic sensors, that can provide a water and solid defence shall be used. It is important to remove particulate and free water contamination from fuels so as to ensure safe operation with regard to these factors. Failure to remove such contaminants may cause failure of the equipment being fuelled placing significant risk on the user. Upon filtration, aviation fuel must be Clear & Bright with no visual evidence of solid contamination or undissolved water. Particulate concentration shall be a maximum of 1 mg/L or ISO 4406 codes 19/17/14/13 and undissolved water shall be a maximum of 30 ppm. If ISO codes are exceeded, gravimetric analysis is required.

b. In cases of delivery of non-aviation fuels by fleet replenishment vessels, the receiving ship is permitted to waive the filtration requirement. However, in such instances the receiving ship accepts the responsibility to ensure that adequate filtration is provided to ensure that particulate and water removal is achieved prior to delivery to the next point in the supply chain. This is regardless of whether the next point in the supply chain is to storage or direct to the end user.

c. Ensuring that the filtration requirement is met is the responsibility of the receiving installation. The only exception to this is the fuelling of aircraft which should only be achieved through the use of dedicated equipment that is designed to perform the correct level of filtration. Filtration equipment of a suitable type, to include where appropriate the use of supplemental electronic sensors, shall be a part of all fuel handling systems (see Table 8-2). The equipment shall be inspected for condition and performance capability in accordance with applicable standards (e.g.: STANAG 3967, EI 1581 etc.) or the equipments operation and maintenance manuals. Electronic sensors that monitor free water and particulate matter are used to supplement filtration equipment in providing both a solid and water defence should conform to EI1598 specification and EI 1570 Handbook. The location of this equipment is to be in accordance with standard NATO design criteria.

d. For clarity, a comparison between filter mesh and pore size of filters is given in Table 8-1.

Comparison between filter pore size and mesh sizes

Pore size (µm)*	Mesh size (number per square inch)
5	2500
10	1250
25	500
50	270
100	140
150	100
200	70

240 *1 µm = micro metre = micron = 10^{-6} m	60

Table 8-1

0802. **Requirements for Bulk Storage of Aviation Fuels on Air Bases**

a. All aviation fuel shall pass through two independent filtration systems. One filtration system shall be at the inlet of the operating tank while the second filtration system shall be at the outlet. This principle shall also apply for aviation fuel delivered via a hydrant system or refuelling vehicle. In all situations, the final level of filtration shall be a Filter Water Separator (FWS) in accordance with either EI 1581 or STANAG 3967. However, it is anticipated that both filtration systems will conform to either of these standards. The use of electronic sensors in combination with a filter water separator can provide a viable alternative. Electronic sensors that are designed to provide both a water and solid defence capability should meet the standards of EI 1598 and EI 1570. Sensors designed to only provide a bulk water defence should meet the standards of EI 1592.

b. Upon filtration, aviation fuel must be Clear & Bright with no visual evidence of solid contaminant or undissolved water. Particulate concentration shall be a maximum of 1 mg/L or ISO 4406 codes 19/17/14/13 and undissolved water shall be a maximum of 30 ppm. If ISO codes are exceeded, gravimetric analysis is required.

NOTE. The design of new equipment and new systems for the handling of military fuels shall not include the use of fuel filter Monitor elements qualified to the standard EI 1583. Fuel filter Monitor elements have not been qualified, nor are they designed or compatible, for use with fuels containing Fuel System Icing Inhibitor (FSII), such as F-34 and F-44.
Fuel filter Monitors contain Super Absorbing Polymers (SAP). The SAP is prone to disintegration when exposed to mixtures of water and FSII. It is also widely acknowledged that the disintegrated SAP material may form deposits downstream of the Monitor vessel, typically within the aircraft fuel system. In the most severe cases this has led to the blockage of aircraft fuel filters. Evidence of SAP migration is generally identified by the presence of a brown sticky deposit and often referred to as “apple jelly”.
In those cases where the use of SAP containing fuel filter Monitors are unavoidable due to design of equipment; frequent change of SAP-containing fuel monitors is strongly advised. In addition, good housekeeping procedures for the draining of free water from bulk storage tanks are mandated.

c. In all situations, filtration equipment shall be designed so that fuel bypass is not possible. If this is not achievable, additional fuel quality testing may be required to ensure fuel integrity.

d. Filtration systems shall be fitted with pressure differential gauges conforming to STANAG 3583, latest edition.

e. Weekly records of the differential pressure readings adjusted to maximum rated flow of the filtration vessel shall be kept. These readings will help to identify when

the filter elements start to become blocked and shall be replaced when the adjusted pressure reaches 15 pSi.

f. Extreme or sudden changes in the differential pressure across the filter vessel are cause for investigation. Such sudden changes may indicate that events such as filter element rupture or the element becoming unseated may have occurred. Replacement of filter elements may be required. It should also be noted, that even when new elements are fitted, there will be a differential pressure across the vessel. In systems where the differential pressure is zero, the elements should be checked to ensure that they have been seated correctly.

g. Inspection and cleaning of the inner wall of filter vessels must be performed whenever filter elements are replaced.

h. Following the replacement of filter elements in any filter system, the effectiveness of the filter system shall be checked by gravimetric(Millipore), particle counting or other approved means of analysis.

i. It is imperative that any free water is drained from the filtration vessel before the start of fuelling at the beginning of the day and whenever else deemed necessary to prevent the possible delivery of free water to the aircraft. This process may be relaxed where a fully working automatic water drain is fitted.

j. In instances where the aviation turbine fuel F-37 is encountered (F-37 is F-34 with the addition of a Thermal Stability Additive, NATO S-1749), a suitable FWS (e.g. EI 1581 class M-100) for this type of fuel shall be used during refuelling or defueling operations.

0803. **Delivery of Fuel**

a. Fuel Delivery Nozzles for Aviation purposes:

a.1 Wire mesh strainers fitted to pressure couplings and over wing nozzles shall be removed and inspected monthly. Where the hose end coupling has to be disassembled to remove the strainer for inspection the integrity of the coupling shall be checked by pressurising the hose to working pressure after reassembly.

a.2 The wire mesh strainers in the refuelling nozzle and pressure refuelling equipment are to have a maximum porosity of 240 µm (60 mesh). These strainers are intended to prevent the entry of coarse particulate into the fuel system of the receiving system.

a.3 If there is evidence of hose break up, the hose(s) identified must be changed immediately. If this is not possible, the refueller is to be withdrawn from service until the hose can be replaced.

a.4 The nozzle dust caps are to be inspected daily for security. They are to be removed only during refuelling operations and replaced immediately afterwards.

b. Direct refuelling from packed stocks is to be avoided whenever possible. In cases where it is not possible, all fuel is to be filtered between the container and the aircraft tank to the standard defined in Table 8-2.

MINIMUM STANDARDS OF FILTRATION - AVIATION USE FUELS

Fuel/ NATO-code	Application	Deliveries to Airfield Receipt/ Settling tanks[1], (filter porosity at entrance of storage medium)	Filling of containers from bulk storage (filter porosity at outlet of filling unit)	Filling of railcar tanks or road tankers (filter porosity at outlet of filling unit)	Issue into On-Base Operating Tanks (filter porosity at inlet of operating tank)	Issue into refuelling vehicles or into dispensers (filter porosity at outlet of filling unit)	Issue into Aircraft[4] (filter porosity at outlet of filling unit)
F-18[4]	Aviation gasoline	Filter Water Separator, nominal 1 µm	Filter Water Separator, nominal 1 µm	150 µm	Filter Water Separator, nominal 1 µm	Filter Water Separator, nominal 1 µm	Filter Water Separator, nominal 1 µm
F-34 / F-35 / F-37 / F-40 / F-44[4]	Aviation turbine kerosene	Filter Water Separator, nominal 5 µm	Filter Water Separator, nominal 1 µm	150 µm	Filter Water Separator, nominal 1 µm	Filter Water Separator, nominal 1 µm	Filter Water Separator, nominal 1 µm
Thrust Augmentation Fluids (methanol and water[2]/methanol mixtures)			80 µm			80 µm	80 µm
F-54[4]	Diesel fuel for UAV's	Filter Water Separator, nominal 5 µm	25 µm				As per the OEM's requirement
F-67 [3,4]	Automotive gasoline for UAV's	Filter Water Separator, nominal 5 µm	25 µm				As per the OEM's requirement

[1] See STANAG 3748 DPP – Technical Guidance for the Design and Construction of Aviation and Ground Fuel Installations on NATO Airfields
[2] Water to be used for the preparation of Thrust Augmentation fluids shall ALSO comply with: total solids (residue on evaporation) max 10 ppm and a pH of minimum 5.0 and maximum 7.0
[3] Note. It has been identified that it is not possible to remove water from gasolines containing bio Ethanol. Further, it has also been identified that a two phase mixture will not manifest itself until there is at least 1500 ppm of water present.
[4] Filter Separator in accordance with EI 1581 or STANAG 3967, electronic sensors that provide both a solid and water defence in accordance with EI 1598 and EI 1570, or other approved filter separator equipment or combinations thereof.

Table 8-2

MINIMUM STANDARDS OF FILTRATION - GROUND USE FUELS

	Application	Filling of containers (packed stocks) filter porosity at outlet of filing unit	Issue into equipment from any bulk storage medium, filter porosity at outlet of fuel delivering system	Issue into equipment from packed stock
F-54[5]	Diesel fuel for ground use only	25 µm	25µm	no requirements
F-63	Diesel engine fuel (kerosene type) for ground use only	If a FWS is present in the kerosene supply chain just prior to the additising step: no additional filtration required; Otherwise 25µm filtration.	25 µm	
F-67	Automotive gasoline for ground use	25 µm	25µm	
F-75/ F-76 additional use	Naval distillate fuel for ground equipment	25 µm	25 µm	

Table 8-3

MINIMUM STANDARDS OF FILTRATION - NAVAL DISTILLATE USE FUELS

		Deliveries to ships, filter porosity at outlet of fuel delivering equipment	Delivery to an on-board gas-turbine, filter porosity at outlet of fuel delivering equipment
F-75/ F-76	Naval distillate fuel	200 µm	FWS[6]

Table 8-4

[5] When ambient temperatures are at or around the cloud point, filtration may be difficult or impossible.
[6] For on board gas turbine engines, the fuel must comply with a particulate content of max 10 mg/l.

SECTION 9 TESTING LABORATORIES AND TESTING CAPABILITY

0901. General

An officially designated laboratory (military or commercial) capable of carrying out full inspection testing of fuels by the approved methods is to be located in, or available to, each NATO nation, and be available to the Service Inspection Authority. Products shall be accepted by the cognisant national inspecting authority in accordance with the nation's regulations. Deployable or field laboratories with limited fuel and fuels testing capabilities shall also comply with the requirements of this AFLP.

0902. Training of Personnel

Qualified personnel are to be assigned responsibility for the receiving/storing/releasing, sampling, and testing of NATO fuels and fuels. Laboratories shall have an established written policy to include documented individual training records of assigned personnel.

0903. Testing Laboratories

a. Fuels shall be tested by proficient laboratories having a quality program and operated by qualified and competent personnel in support of the applicable contracts and product specifications and/or standards. NATO National laboratories are listed in STANAG 4616 with their respective testing capability. In addition, nationally fielded laboratories, contractor's laboratories or limited testing capability facilities are commonly used to accept or reject fuel loads at point of custody transfer.

b. Testing laboratories shall adopt a quality program which shall contain a quality control plan describing the method by which all laboratory and field testing and measuring equipment is calibrated in accordance with ISO 10012-1. For items not covered by that publication, the applicable manufacturer's recommended calibration method(s) and time interval shall be used.

c. Forward operating laboratories having limited testing capability and equipment shall be capable of testing representative fuel samples in accordance with the product specification requirements.

0904. Product Specifications

Fuel laboratories and testing facilities shall maintain an up-to-date file of specifications as per STANAG 1135 Annex C (both Military and non-Government specifications and standards).

0905. Fuel Traceability

Fuel manufacturers produce fuel in batches. Each production batch is a discrete volume size and upon compliancy to the specification/standard requirements, is assigned an identifying batch number. The batch number shall remain valid until stocks are exhausted or until fresh stock is introduced at which time another analysis shall be performed and a new batch number assigned. Fuel traceability is critical when investigating a fuel contamination situation. When fuel batches from different sources are co-mingled, either a cursory verification test schedule is performed for a positive segregated system, or a re-certification test schedule may be required in case of a non-segregated system to ensure fuel integrity. This test should be made in comparing the recertification results with the corresponding values shown on the last previous analysis made on the fuel. Only by checking that the determined properties have not exceeded the margin of error of the test method, can it be safely assumed that the remaining unchecked specification properties have also not changed significantly and remain satisfactory.

0906. Batch Analysis Test Report

An original manufacturer batch analysis test report, designated as a refinery Certificate of Analysis (RCQ), shall be raised for each batch tested and shall show the specification requirements for the product tested, the date, the test method, and the test results. It shall also include the quantity of the batch and the number of the tank containing the product. The test report shall be signed by a designated representative of the test laboratory. At point of custody transfer, minimum quality control testing shall be performed in accordance with the requirements detailed at Annex E B1and as defined in the appropriate product Table in Section 2. Results shall be compared to the original batch analysis test report and any discrepancies identified. When fuel is co-mingled and further distributed along the supply chain, acceptance tests are performed and documented. Additional testing to confirm the absence of contaminants may be performed to issue a re-certification certificate. Note that a refinery RCQ includes the amount of hydroprocessed and severely hydroprocessed jet fuel, and the amount of anti-oxidant injected. A downstream CoA may not include such information.

0907. Testing Capabilities

Laboratories shall be equipped and capable of performing acceptance and re-certification tests (Type B1 and/or B2) required by the appropriate product Table in Section 2. When the capability does not exist locally, other laboratories may be used in support of the tasking authority. Samples for testing shall be obtained in accordance to recognized standards such as ASTM D4057. For automatic sampling ASTM D 4177 shall be used. Field testing facilities should institute a formal process for fuel acceptance based on the minimum quality testing as detailed in the appropriate product Table in Section 2.

0908. Test Methods

All laboratory tests shall be conducted in accordance with the method prescribed in the specification covering the product. Special or modified method shall be

documented and reported. Specification and intra-Governmental receipt limits such as those listed in STANAG 1110 are absolute. Multiple tests may be performed and when the results do not differ from each other by more than the amount specified for the repeatability of the method, these results may be averaged to determine compliance with the specification limits.

0909. Alternate Test Methods

The use of alternate test methods to measure physical properties of fuel is allowed, provided that: the test results are presented in the format required in the specification; the test device has a demonstrated reliability and repeatability equal or better than called for by the standard method; and the device has been approved for use by the military services or the handling nation's technical authority.

0910. Calibrating Testing Equipment

All laboratories shall calibrate testing and measuring equipment to the accuracy necessary to ensure the equipment is within allowable tolerance limits. ISO 10012-1, Part I shall be used. Chemical solutions used in quantitative analysis shall be prepared from reagent grade chemicals and shall be prepared and standardized in accordance with test method requirements. Control, charts, reference tables, etc., prepared or used in connection with tests or in calculating final results shall have a factual basis, and be mathematically correct.

0911. Testing for Contamination

Laboratories testing for suspected contamination of fuels shall be confirmed and controlled by documented laboratory tests by using standardized or non-standardized test methods. The use of non-standard test protocols should, as a minimum, detail the procedure, equipment used including chemical reagents and calibration procedures. Non-conformance results shall be documented and reported to justify the appropriate corrective actions.

0912. Fuel Test Results Form

Fuel Test Results

Fuel source/origin	Fuel type

Date	Name	Signature

TYPE C (all fuels)

Visual Inspection						
Clear and Bright		Colour	Density			
			RCQ/CoA/Test Certificate		Reading (kg/m^3)	Difference (investigate if ± 3 kg/m^3)
Rating clear (trace particulate or suspended matter)	Rating bright (hazy, cloudy, free water)	Report	Sample ID/Report Number	Density at 15°C A	B	B - A

Additional tests for TYPE C+

Fuel System Icing Inhibitor (FSII) (F-34, F-40, F-44 only)	Electrical Conductivity (F-34, F-35, F-40 only)	Flash Point (F-44, F-75, F-76 only)
Reading (% vol)	Reading (pS/m at Ambient Temp °C)	Reading (°C)

SECTION 10 GLOSSARY

1001. Throughout this AFLP, a number of definition/terms are used. In order to aid the user, these definitions/terms are identified in this Section.

Acceptance	The act of an authorized NATO, Government or authorized 3rd-party (sub-contractor) representative by which the Government assumes for itself, or as an agent of another, ownership of existing and identified supplies tendered, or approves specific services rendered, as partial or complete performance of the contract on the part of the contractor.
Additives	Compounds used to impart new properties to a product or to improve a property which it already possesses.
Appearance	Colour, clarity, or evidence of stratification and contaminants that may be observed by visual examination of sample at ambient temperature.
Barrel	A volume of liquid fuel equal to 159 litres.
Batch	A distinct quantity of fuel that can be defined by a single Refinery Certificate of Quality, Recertification Certificate or Certificate of Analysis.
Black Cargo	A cargo or parcel of fuel such as Crude Oil, Heavy Fuel Oils, etc. These are normally products that contain residual components that make them dark in colour.
Blending	The procedures by which predetermined quantities of two or more batches are homogeneously mixed. This term is also used to define the injection of additives into fuels.
Bulk products	Liquid fuels which are normally transported by pipeline, rail tank car, tank truck or trailer, barge or ocean going tanker, and stored in tanks or containers having a capacity of more than 1000 Litres.
Bulk water detector	An automated device for the detection of a bulk quantity of free water in fuel in flowing conditions.
Certificate of Analysis	CoA (Certificate of Analysis) is a document which shows the applicable specification requirements of the product tested, the date, the test methods followed and the test results. It also includes the quantity of the batch, the batch number, the tank identification and the different batches comingled in the tank. The CoA is valid for up to 180 days.

Clear and bright	Clear is the absence of visible solids, a cloud, a haze, an emulsion, or free water in the product (some specifications define this as Appearance, Workmanship, or Finish) at the temperature of sampling. Bright is the sparkle of clean, dry product in transmitted light.
Conductivity	The ability of a given substance to dissipate or transfer internal electrical charges.
Contaminant	A foreign substance in a product.
Contaminated product	A product into which one or more grades of another product has been inadvertently mixed (commingling), or a product containing foreign but not limited to dust, rust, water, or emulsions to the extent it may change the characteristics of the product.
Cubic metre (m^3)	A volume of liquid fuel equal to 1000 litres.
Custody Transfer Point	An agreed designated physical location (e.g. valve, meter, etc.) in which legal possession and/or responsibility for a parcel of fuel transfers from one party to another.
Dedicated system (Single product, Segregated)	A system of pipeline(s), vessel(s), rail tank car(s) and/or truck(s) used solely to move only one type of fuel.
Density	The mass of liquid per unit volume at a standard temperature. Typically this will be at 15°C.
Deteriorated product	A product in which one or more of its characteristics have changed to a level outside the limits of the applicable STANAG or specification and STANAG 1110.
Dissolved water	Water in solution which cannot be removed by mechanical means. The concentration of dissolved water varies with product temperature, the relative humidity of air contacting the product surface and the chemical composition of the product.
Electronic sensor	An automated device for the detection of particulate matter and/or free water
Filtered (filtering)	A process of mechanically removing solids and/or free water from a fuel using a medium such as filtering paper, glass fibre, clay or diatomaceous earth.
Filter Water Separator	A mechanical device designed to remove solid contaminants and to coalesce and separate water from fuels. Normally configured in a 2 stage design: 1st stage coalescer cartridges to remove sediment and coalesce water into large droplets; 2nd stage separator cartridges (normally Teflon coated screen or pleated paper) which repel the coalesced water for collection from the sump.
Free-on-Board (FOB) Destination. Shipper provides transportation	Product is accepted at destination by an authorized NATO, Government or authorized 3rd-party (sub-contractor) representative.

Free-on-Board (FOB) Origin. The procuring activity provides transportation	Product is accepted at origin (source) by an authorized NATO, Government or authorized 3rd-party (sub-contractor) representative.
FSII	Fuel System Icing Inhibitor. A fuel additive to prevent formation of ice crystals when water is present.
Fuel Monitor	A single stage water protection type filter that removes water and sediment. The system is designed to absorb water and stop fuel flow once the cartridge elements reach full water capacity. NOTE. Filter Monitors shall not be used with fuels containing FSII.
Fungible Pipeline System	Fungible pipeline systems are those that transport products co-mingled with quantities of other product meeting the same specification
Gum	Resin-like, insoluble fuel deposits (contaminants) formed during the oxidative and thermal deterioration of fuels.
Heavy distillates	A blend of distillate and residual fuel oil, for use in low- and medium-speed diesel engines in applications involving predominantly constant speed and load
Homogeneous / Homogeneity	A product is considered homogeneous when its base components are mixed uniformly throughout (i.e.no layering or stratification).
Identification tests	Selected tests applied to a sample to quickly determine the type or grade of product represented or to determine that quality has not been altered by time or handling. Normally Type-C tests.
Injection	A technology used for the inclusion of an additive, along with other techniques such as blending to modify the characteristics or the type of product. May also be used to remediate off-specification product.
Inspect	To examine critically especially to detect flaws, errors, etc.
Interface	The common boundary (or surface) of two liquids. Also, the amount of mixed product (off-specification) between two different on-specification products.
Intermediate Bulk Container (IBC)	Generally a large size type of packaging made from plastic, up to a maximum volume of 1000 litres.
ISO Code	ISO cleanliness code defined by ISO 4406. The ISO cleanliness code is a pseudo-logarithmic scale number of particles per ml of fluid. The standard format reports the number of particles per ml greater in size than 4, 6, 14 and 30 microns in diameter.
Micron (µm)	One micron (micrometer, 10^{-6} metre) is one-thousandth of one millimetre (25,400 microns equal one inch).

Micronic Filter	A sediment pre-filtration unit primarily used upstream of filter water separators or clay filters for removal of particulates.
Middle distillates	A general classification of refined fuels that includes distillate fuel oil and kerosene.
National Technical Authority (NTA)	Manages all aspects of fuels, lubricants and associated products quality, from procurement to the end users in line with national and NATO standards, guidelines and policies.
Off-specification product	A product which fails to meet one or more of the physical, chemical, or performance requirements of the applicable STANAG.
Positive Segregation	A means of preventing aviation fuel from contamination by other grades and/or products that is more effective than segregation. Examples are double block and bleed valve; spectacle blinds, spades or equivalent; or removable distance pieces like spools or flanges.
Quality	The composite of materiel attributes including performance, features and characteristics of a product, or service to satisfy a given need.
Quality assurance	A planned and systematic pattern of all actions necessary to give confidence that adequate technical requirements are established; products and services conform to established technical requirements; and satisfactory performance is achieved. (The generic quality assurance definition includes all actions beginning in the design phase through procurement, storage and handling, transportation and use.)
Quality surveillance	The aggregate of measures (blending, stock rotation, sampling, etc.) used to determine and maintain the quality of product receipts, storage of products, and issuing of product to the degree necessary to ensure that such products are suitable for their intended use.
Quality Surveillance Programme	Programme of inspections, sampling, testing, and documentation established to assure quality of product.
Refinery Certificate of Quality	The definitive written document describing and certifying the quality of a product upon shipment from a refinery. The document must include the following as a minimum: - Specification name, issue and any amendment number; - Name and address of testing laboratory; - Batch number or unique identifier; - Quantity of fuel in the batch; - Properties tested and including specification limit, test method and result of test;

	- Additives, including qualification reference and quantity added; - Name and position of authorized test certificate signatory or an electronic signature; - Date of certification.
Road Tank Vehicle (Tank Wagon, Bridger, Bowser)	A motorised vehicle or towable trailer with a tank that is used to move bulk fuels on normal transportation routes (roads, motorways, etc.)
Sample	A sample(s) is a portion of fuel taken which represents a portion or the entire batch or delivery. For Bulk Products, a sample can be taken from an acceptance tank, storage tank, delivery truck, intermodal container, pipeline, barge or tanker. Samples may be taken either manually (upper, middle, lower, all-level) or automatically (line, flow-proportionate).
Specification	A detailed description of the product's essential performance and/or physical and chemical characteristics. Specifications can be classified as National, Military, Commercial, or Voluntary Standard. Specifications can be categorized as functional, design, or a performance specification. Some specifications, such as petroleum, are usually a combination of functional and performance.
Testing	The determination of product physical and chemical properties. Testing requirements are dependent on the location, mode of storage and/or transportation.
Thief	A sampling apparatus designed so a liquid sample can be obtained from any specified point in the container.
Tolerance	An allowable variation from a specified standard.
Undissolved (Free) Water	Water in a fuel other than dissolved water. Undissolved water may be in the form of droplets or haze (entrained) suspended in the product and/or water layer at the bottom of the container.
White Cargo	A cargo or parcel of fuel such as Gasoline, Jet Fuel, Kerosene, Light Gas Oil (distillates), etc. These are normally refined, clean products which are not dark in colour.

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