

NCIA/ACQ/2020/6711  
18 May 2020

To : Distribution List  
Subject : Amendment 7 – RFQ-CO-15559-AMDC2  
NCI Agency Air and Missile Command and Control – Shelters for Deployable ARS  
Security Upgrade Project (SUP)

References : A. AC/4-2261 (1996 Edition)  
B. AC/4(PP)D/25330-ADD4  
C. AC/4(PP)D/25703-ADD5  
D. AC 4-DS(2019)0019 (INV)  
E. Issuance of IFB-CO-15559-AMDC2 dated 16 Mar 2020  
F. Issuance of IFB-CO-15559-AMDC2 Amendment 1 dated 20 Mar 2020  
G. Issuance of IFB-CO-15559-AMDC2 Amendment 2 dated 27 Mar 2020  
H. Issuance of IFB-CO-15559-AMDC2 Amendment 3 dated 01 Apr 2020  
I. Issuance of IFB-CO-15559-AMDC2 Amendment 4 dated 07 Apr 2020  
J. Issuance of IFB-CO-15559-AMDC2 Amendment 5 dated 14 Apr 2020  
K. Issuance of IFB-CO-15559-AMDC2 Amendment 6 dated 4 May 2020

1. In accordance with Reference A, the purpose of this Amendment 7 is to answer to the Clarification Requests (CR) received from Prospective Bidders (Attachment A) on Answers to Clarification Requests published by reference G.
2. The answers to CRs require one revision to the RFQ within the Part IV, Statement of Work Annex C, Technical Specification; which is hereby attached (Attachment B). For ease of reference, all changes in the document have been marked using the "track changes" function.
3. By virtue of this amendment, the Attachment A and Attachment B cancel and supersede any previous version issued in the context of the Request for Quotation in subject.
4. Except as provided in the paragraphs above, all other terms and conditions of the Request for Quotation remain unchanged.
5. The Bid Closing Date for RFQ-CO-15559-AMDC2, as stated in reference E, remains unchanged as reflected hereafter.

**Bid Closing Time for RFQ-CO-15559-AMDC2 is 14:00 (Brussels time) on 22 June 2020.**

6. The Purchaser Point of Contact for all information concerning this RFQ is:

NCI Agency, Acquisition Directorate  
Boulevard Léopold III 1110 Brussels, Belgium  
POC: Mr. Martin Steenwege, Senior Contracting Officer  
TEL: +32 2 707 8335  
E-mail: Martin.Steenwege@ncia.nato.int

FOR THE GENERAL MANAGER:

Mr. Martin Steenwege  
Senior Contracting Officer





NATO UNCLASSIFIED

NCIA/ACQ/2020/6711

**Enclosures:**

**Attachment A:**

Answers to Clarification Requests RFQ-CO-15559-AMDC2 Amendment 7

**Attachment B:**

RFQ-CO-15559-AMDC2 Technical Specification for the Procurement of the DARS Security Upgrade Shelters

**Attachment A – Answers to Clarification Requests**

18/05/2020

<b>TECHNICAL</b>					
<b>Serial Nr</b>	<b>RFQ Book</b>	<b>RFQ Section Ref.</b>	<b>QUESTION</b>	<b>ANSWER</b>	<b>Published by Amendment #</b>
<b>T.1</b>	SoW	Para 1.2  Para 5.4.3	System Integration Test shall be performed after integration of PFE equipment. Please state who is the responsible for the PFE integration.	PFE integration is the Purchaser's responsibility. Contractor's responsibility stated in Para 5.4.3.2 and 5.4.3.3 and 5.4.3.4	Amendment 2
<b>T.2</b>	SoW – Annex A	Para 2	The reference document does not list any shelter standard as per 6516-SHCPE-86. Please state if the shelter shall be aluminium military technology as per the 6516-SHCPE-86 or it can be commercial technology type (iron steel)	Steel is acceptable and shall meet relevant ISO standards	Amendment 2

TECHNICAL					
Serial Nr	RFQ Book	RFQ Section Ref.	QUESTION	ANSWER	Published by Amendment #
T.3	Part 4, Chapter 1, Section 1, Annex C – Appendix A Functional Requirements	6.3. Shelter Butting Kit  6.4. Contamination Control Area Tents	Please clarify what equipment shall be delivered with the SBK and CCAT (i.e. lighting system)	SBK - Corridor Assembly including interface frame for attaching the SBK to the shelter. - Walkway Assembly, support brackets and flooring - Wall and roof supports poles.  CCAT: - The Waterproof Cover (Flysheet) - Inner Corridor (Airlock) Assembly - Gable Interface - Gable End - Floor Boards and support brackets - All metal cover framework items	Amendment 2
T.4	Part 4, Chapter 1, Section 1, Annex C – Appendix A Functional Requirements	(DSU-FU-48) CCAT Penthouse Size	Please clarify what are the CCAT ancillaries equipment and if they are under the SoW	None.	Amendment 2

TECHNICAL					
Serial Nr	RFQ Book	RFQ Section Ref.	QUESTION	ANSWER	Published by Amendment #
T.5	Part 4, Chapter 1, Section 1, Annex C – Appendix A Functional Requirements	(DSU-FU-5) Fire Alarm System	Please state if there is any specification for the Fire Alarm System such as alarm management via SNMPv3 protocol etc.	No fire alarm system management via SNMP.	Amendment 2
T.6	Part 4, Chapter 1, Section 1, Annex C – Appendix A Functional Requirements	(DSU-FU-6) Alarms	<p>The alarms are required also for outside, Please confirm a control board shall be installed outside the shelter.</p> <p>Please confirm the outside equipment to be installed on the SUP shelters shall be housed in a dedicated technical compartment or can be on board on the shelter walls</p>	<p>No alarms required for the outside, only alarm status indicators.</p> <p>Outside equipment shall be housed inside.</p>	Amendment 2

<b>TECHNICAL</b>					
<b>Serial Nr</b>	<b>RFQ Book</b>	<b>RFQ Section Ref.</b>	<b>QUESTION</b>	<b>ANSWER</b>	<b>Published by Amendment #</b>
<b>T.7</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix A Functional Requirements	(DSU-FU-10) Cabinet Fitting	6 Racks are required 1,2m depth. This, taking into account the shelter walls panel, the physical separations between different security levels, the hvac and BC filter installation will force the racks to be installed along a single wall. Please confirm the assumption or provided a suggested layout	Yes, that is a valid assumption as long as the spacing requirement are met. Design is for to the Bidder/Contractor	Amendment 2
<b>T.8</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix A Functional Requirements	(DSU-FU-13) Data Cable Installation	Please clarify if data cable to be installed shall be provided or are PFE	Data cable such interconnections between racks, for example, shall be the contractor. Data cables for the network and server equipment shall be PFE.	Amendment 2

<b>TECHNICAL</b>					
<b>Serial Nr</b>	<b>RFQ Book</b>	<b>RFQ Section Ref.</b>	<b>QUESTION</b>	<b>ANSWER</b>	<b>Published by Amendment #</b>
<b>T.9</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix A Functional Requirements	(DSU-FU-25) Shelter Connection  (DSU-FU-36) SBK Interconnection	Please provide the DARS Operations shelter doorway where SBK and CCAT should be mounted	Each SBK shall provide the ability to interconnect the doorways of a single clutch of any two shelters.  For dimensions, site survey would be required.	Amendment 2
	Part 4, Chapter 1, Section 1, Annex C – Appendix A Functional Requirements	(DSU-FU-26) SBK and CCAT Integrity	Please confirm the shelter integrity shall be maintained with the door closed.	Correct	Amendment 2

<b>TECHNICAL</b>					
<b>Serial Nr</b>	<b>RFQ Book</b>	<b>RFQ Section Ref.</b>	<b>QUESTION</b>	<b>ANSWER</b>	<b>Published by Amendment #</b>
<b>T.10</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix A Functional Requirements	(DSU-FU-40) SBK Length	Please clarify the size of the SBK. What are the minimum width and height ?	<p>The SBK is required to connect 2 shelters. Typical ergonomics engineering should help determine dimensions based on the x Percentile man characteristics, however the doorways also provides for limitations. Current shelter door dimensions: 1840mm x 900mm</p> <p>Approximate SBK dimensions: Width: 1410mm Height: 2240mm</p>	Amendment 2
<b>T.11</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	3.1.8. Wind Speed Operation and Maintenance	The gust value of 60 m/s could exceed the tent structural capability. Please confirm the requirement	Gust value at para 3.1.8 is incorrect, it should read 40m/s.	Amendment 2



<b>TECHNICAL</b>					
<b>Serial Nr</b>	<b>RFQ Book</b>	<b>RFQ Section Ref.</b>	<b>QUESTION</b>	<b>ANSWER</b>	<b>Published by Amendment #</b>
<b>T.12</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	3.1.10. Wind Speed Survival	The wind speed survival values seems to be not consistent with the operational and storage wind speeds since are lower of these latter. Please clarify	Gust value in 3.1.10 is correct at 50m/s	Amendment 2
<b>T.13</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	3.1.20. Gradient	Please confirm if the 10° ground slope requires levelling jacks for the system	Leveling equipment shall be required for Operation.	Amendment 2
<b>T.14</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	3.3.7. Free-Fall in Transport Cases	Please confirm the requirement is for the SBK and CCAT Transport Cases if any	While Transport Cases are not a specific requirement for the SBK & CCAT, they should be packed so as to protect them during transport and storage. If Transport cases are provided they should, conform the 3.3.7 requirement.	Amendment 2
<b>T.15</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	3.3.8. IP Rating During Transport And Storage	Please confirm the IP65 rating can be met by means of a rain test on shelter	Yes if it is accordance with IEC60529. Testing would more orientated to a spray test for IP65.	Amendment 2

TECHNICAL					
Serial Nr	RFQ Book	RFQ Section Ref.	QUESTION	ANSWER	Published by Amendment #
T.16	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	4.1. Transportation Requirements	Please confirm the CSC certificate for ISO containers meet the transport requirements	Yes with the proper certification will meet this requirement. A cross Reference of requirements to CSC certification parts shall be provided as CSC in itself does not address the specific requirements.	Amendment 2

TECHNICAL					
Serial Nr	RFQ Book	RFQ Section Ref.	QUESTION	ANSWER	Published by Amendment #
T.16 bis	T.16 bis	T.16 bis	Please confirm the CSC certificate for ISO containers meet the transport requirements	<p>They both can be used. For clarity we can stick to the ISO standard.</p> <ul style="list-style-type: none"> <li>- ISO standards allow containers to be stackable to 9 container height (24K kg containers).</li> <li>- CSC maximum stacking capability based on weight. For example, a 9-high stacking of 24-ton (24,000 kg) containers the mass on the bottom container would be 8 x 24 tons (24,000 kg), i.e.. 192 tons (192,000 kg).</li> </ul> <p>Thus, in the case of a 24-ton container with 9-high stacking capability the plate should indicate: ALLOWABLE STACKING MASS FOR 1.8g: 192,000 kg.</p>	Amendment 4

<b>TECHNICAL</b>					
<b>Serial Nr</b>	<b>RFQ Book</b>	<b>RFQ Section Ref.</b>	<b>QUESTION</b>	<b>ANSWER</b>	<b>Published by Amendment #</b>
<b>T.17</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	5.2.3. Door-open Operation	Please confirm the HVAC/BC systems reduced performances are acceptable when door is open	Concur; with the door Open, the HVAC/BC systems reduced performance is acceptable given that system remain operational during the door-open limited period.	Amendment 2
<b>T.18</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	5.3.5. Container/Transport Case Cable Entry Panels	Please clarify what are the transport cases for and the entry panel scope	Generic requirement in case Transport Cases are used to house operational components	Amendment 2
<b>T.19</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	6.11.7. Door Keypad Entry	Please clarify the keypad function. Shall the door to be equipped with an electrical closing system ?	Mechanical closing system shall meet this requirement.	Amendment 2
<b>T.20</b>	Part 4, Chapter 1, Section 1, Annex C – Appendix B Non Functional Requirements	9.1.7. Minimum External Air Circulation	Please confirm the fresh air flow shall be provided by the BC filter both for peacetime and BC attack.	Depends upon the HVAC/BC system design	Amendment 2

<b>TECHNICAL</b>					
<b>Serial Nr</b>	<b>RFQ Book</b>	<b>RFQ Section Ref.</b>	<b>QUESTION</b>	<b>ANSWER</b>	<b>Published by Amendment #</b>
<b>T.21</b>	Part 4, Chapter 1, Section 1, SoW	3.2.3 EMSEC	“Containers must conform to TEMPEST level Class B”. Please confirm that this requirement implies that the fully equipped shelter with PFE shall not leak to the outside compromising emanations exceeding those stated in SDIP 27 for Level B equipment. If the latter is not the case, please provide the applicable standard.	The container itself needs to be qualified as Class B in accordance to SDIP 27/2 not the equipment inside the shelter by applying technical means to the shelters. The CIS equipment inside the shelter do not provide any emission security measures and will be UNTESTED with the exception of certain security devices (e.g. Cryptos)	Amendment 2
<b>T.21.Bis</b>	<b>T.21.Bis</b>	<b>T.21.Bis</b>	Do we need to show references on having certified TEMPEST Shelters, or we just need to show our capacity to be described in our technical proposal?	The Bidders must show references on having certified TEMPEST Shelters	Amendment 3

TECHNICAL					
Serial Nr	RFQ Book	RFQ Section Ref.	QUESTION	ANSWER	Published by Amendment #
T.22	Part 4, Chapter 1, Section 1, SoW Appendix A and Annex E, Appendix F.	3.2.3 EMSEC, <i>DSU-FU-4</i> Equipment List	In order to determine the correct spacing of the equipment racks according to SDIP 29, please state, which is the Level of compromising emanations of the CIS equipment in the Equipment list in Appendix F. Are they SDIP 27 Level A, B or C?	Refer to T.21. The CIS equipment inside the shelter do not provide any emission security measures and will be UNTESTED with the exception of certain security devices (e.g. Cryptos). Emission Security measures are expecting by the shelter.	Amendment 2
T.23	Part 4, Chapter 1, Section 1, Annex C	Page 19: Appendix B - Non-functional Requirements, Para 5  Page 60: Appendix I – Verification Cross Reference Matrix	Appendix B and Appendix I, referencing (DSU-NF-xx) is misaligned from DSU-NF-80 onwards as illustrated in the extracts below. The impact of this is that we cannot be sure of the methods of verification required for each requirement.	Appendix I is re-indexed to meet the actual non-functional requirements, Cable Labelling is covered already by Cables/Wires Identification. The line was an error from a previous reiteration of the Appendix I and is now removed	Amendment 6

TECHNICAL					
Serial Nr	RFQ Book	RFQ Section Ref.	QUESTION	ANSWER	Published by Amendment #
T.24	Part 4, Chapter 1, Section 1 – Appendix A	Functional requirements 6. Shelter Butting Kits and Contamination Control Area Tents	Please confirm that there is no reference to the Non-functional requirements for the budding kits and tents (Appendix B)? Please confirm there are no specific design and/or environmental requirements for the budding kits and Tents?	Shelter Butting Kits and Contamination Control Area Tents are considered Deployable Entities and they follow the non-functional requirements listed in Annex C – Appendix B and there are no additional design or environmental requirements.	Amendment 6
<u>T.25</u>	<u>Part 4, chapter 1, Section 1 – Appendix A Functional requirements</u>	<u>Chapter 6. Shelter Butting Kits and Contamination Control Area Tents (DSU-FU-26)</u>	<u>Are there no specific non-functional requirements for the SBK &amp; CCAT (e.g. water tightness, wind- and snow load)?</u>	<u>Confirm that there are no specifics specifications and/or references written for the SBK and the CCAT. However, it must meet the CODE Requirements specified under Appendix B (Chapter 3 – Environmental Requirements).</u>	<u>Amendment 7</u>
<u>T.26</u>	<u>Part 4, chapter 1, Section 1 – Appendix A Functional requirements</u>	<u>Chapter 6. Shelter Butting Kits and Contamination Control Area Tents (DSU-FU-26)</u>	<u>Is there also an shower solution required after the Fullers Earth procedure?</u>	<u>No shower solution required</u>	<u>Amendment 7</u>

TECHNICAL					
Serial Nr	RFQ Book	RFQ Section Ref.	QUESTION	ANSWER	Published by Amendment #
<u>T.27</u>	<u>Part 4, chapter 1, Section 1 – Appendix A Functional requirements</u>	<u>Chapter 9.2. – 9.5. CB Filter</u>	<u>Does the CB filter system needs to be certified in accordance with STANAG 4447 (tested acc. AEP 54)?</u>	<u>AEP 54 Ed. 2.</u>	<u>Amendment 7</u>
<u>T.28</u>	<u>Part 4, chapter 1, Section 1 –Appendix B – Non Functional requirements</u>	<u>Chapter 9.6. – 9.9. FAN – Overpressure - Alarm</u>	<u>Does the SBK and CCAT needs to maintain the same overpressure as required for the shelter?</u>	<u>Yes, there will need to be an equalization.</u>	<u>Amendment 7</u>
<u>T.29</u>	<u>Part 4, chapter 1, Section 1 –Appendix B – Non Functional requirements</u>	<u>Chapter 9.6. – 9.9. FAN – Overpressure - Alarm</u>	<u>Are the (extreme low values) of overpressure and alarms correct?</u>	<u>Requirement unit of measure correction – Updated Annex C</u>	<u>Amendment 7</u>



NATO UNCLASSIFIED

# RFQ-CO-15559-AMDC2 AMENDMENT 7 ATTACHEMENT B

NATO UNCLASSIFIED

# NATO Communications and Information Agency

CO-15559-AMDC2

## Technical Specification

For the Procurement of the  
**DARS Security Upgrade Shelters**



Part 4, Chapter 1, Section 1, Annex C

Rev: ~~3-4~~ (20-12 April-May 2020)

This Page Intentionally Left Blank.

# NATO UNCLASSIFIED

DARS Security Upgrade Shelters, Part 4, Chapter 1, Section 1

CO- 15559 – AMDC2

ECP No	Revision	Date
Initial Release	-	31 October 2019
AMDC2 Coordinated	1	31 January 2020
Fix a typo in para 3.1.8 and 3.1.9	2	26 March 2020
Remove wrong references in Appendix I and correct numbering sequence for Non-Functional requirements	3	20 April 2020
<a href="#">Requirement unit of measure correction in para 9.6.2, 9.8.2, 9.9.2 and 9.15.5</a>	<a href="#">4</a>	<a href="#">12 May 2020</a>

This Page Intentionally Left Blank

**TABLE OF CONTENTS**

1	Introduction .....	1
2	Document References .....	1
Appendix A Functional Requirements .....		2
1.	CIS Equipment Container .....	2
2.	19" Equipment Cabinets .....	2
3.	Cable Access Vaults .....	3
4.	Cabling .....	3
5.	Physical Installation and Integration.....	3
6.	Shelter Butting Kits and Contamination Control Area Tents.....	4
Appendix B Non-functional Requirements .....		8
1.	Definitions .....	8
1.1.	Commercial Off The Shelf (COTS) .....	8
1.2.	Developed Item (DI) .....	8
1.3.	Line Replaceable Unit (LRU).....	8
2.	Characteristics of Deployable Entities (CODE) Requirements .....	8
2.1.	Environmental requirements.....	8
2.2.	Transportation Requirements .....	8
2.3.	Physical Portability Requirements .....	9
2.4.	Design & Construction Requirements.....	9
2.5.	Electrical Requirements .....	9
2.6.	Survivability Requirements .....	9
2.7.	HVAC and CBRN Requirements .....	9
2.8.	Safety Requirements .....	9
2.9.	Human Factors Requirements.....	9
3.	Environmental Requirements .....	9
3.1.	Natural Environmental Conditions .....	9
3.1.1.	Climatic Zones - Operation .....	10
3.1.2.	Climatic Zones - Transport.....	10
3.1.3.	Climatic Zones - Storage .....	10
3.1.4.	Climatic Zones - Maintenance .....	10
3.1.5.	Change of Temperature (Temperature Shock) .....	10
3.1.6.	Lightning .....	10
3.1.7.	Air Pressure Range .....	10
3.1.8.	Wind Speed Operation and Maintenance .....	10
3.1.9.	Wind Speed Transportation and Storage .....	10
3.1.10.	Wind Speed Survival .....	11
3.1.11.	Wind Speed Survival Preparation .....	11
3.1.12.	Solar Radiation .....	11
3.1.13.	Rainfall.....	11
3.1.14.	Salt Spray .....	11
3.1.15.	Snow Loading Operation and Maintenance .....	11
3.1.17.	Ice Loading .....	11
3.1.18.	Hailstones .....	11
3.1.19.	Dust & Sand .....	11
3.1.20.	Gradient.....	11
3.2.	Induced Environmental Conditions .....	12
3.2.1.	Environmental Conditions in Air Transport.....	12
3.2.2.	Environmental Conditions & Mechanical Constraints in Transport.....	12
3.2.3.	Environmental Conditions & Mechanical Constraints in Storage.....	12
3.2.4.	Securing of Items during Transportation .....	12
3.3.	Mechanical Requirements .....	12
3.3.1.	Inclination .....	12
3.3.2.	Shock.....	12
3.3.3.	Vibration .....	12
3.3.4.	Acceleration .....	12
3.3.5.	Bump .....	13
3.3.6.	Drop and Topple .....	13

3.3.7.	Free-Fall in Transport Cases .....	13
3.3.8.	IP Rating During Transport And Storage .....	13
3.3.9.	IP Rating In Operation .....	13
3.3.10.	IP Rating Internal .....	13
3.4.	Biological and Chemical Requirements .....	13
3.4.1.	Salt Fog .....	13
3.4.2.	Acid Atmosphere .....	13
3.4.3.	Contamination by Fluids .....	13
3.4.4.	Decontamination.....	13
3.4.5.	Mould Growth in Operation .....	13
3.4.6.	Mould Growth during Storage and Transport .....	14
4.	Transportation.....	14
4.1.	Transportation Requirements .....	14
4.1.1.	Road Transportation – Prime Mover Equipment .....	14
4.1.2.	Road Transportation – Flat Bed .....	14
4.1.3.	Rail Transportation .....	14
4.1.4.	Water Transportation .....	14
4.1.5.	ISO Corner Handling Equipment.....	14
4.1.6.	ISO Corner Ground Clearance .....	14
4.1.7.	Shelter Deployment via ISO Container .....	14
4.1.8.	Transport by Transport Aircraft .....	14
4.1.9.	Helicopter Underslung Load .....	15
4.1.10.	Shelter Roof Protection.....	15
4.2.	Physical Portability Requirements .....	15
4.2.1.	Weight Limits for One-person Definition .....	15
4.2.2.	Lift Frequency .....	15
4.2.3.	Obstacles.....	15
4.2.4.	Carry Distance .....	15
4.2.5.	Mass Distribution .....	15
4.2.6.	Weight Limits for One-person .....	15
4.2.7.	Weight Limits for Two Persons .....	16
4.2.8.	Weight Limits for Multiple Persons.....	16
4.2.9.	Tools.....	16
4.2.10.	Portability Tools .....	16
4.2.11.	Weight Labelling .....	16
4.2.12.	Special Lifting Points .....	16
5.	Design & Construction Requirements .....	17
5.1.	Materials.....	17
5.1.1.	Specification of Electrical Cables .....	17
5.1.2.	Dissimilar Metal Selection.....	17
5.1.3.	Corrosion Protection .....	17
5.2.	Construction .....	17
5.2.1.	Modularity of Equipment .....	17
5.2.4.	Equipment Lubrication .....	18
5.2.5.	Rigidity – LRU Exchange .....	18
5.2.6.	Rigidity - Doors .....	18
5.2.7.	Cable Extenders and Retractors.....	18
5.2.8.	Access Doors Protection.....	18
5.2.9.	Protection against Incorrect Location .....	18
5.2.10.	Transport Cases .....	18
5.2.11.	Equipment Controls Protection .....	18
5.3.	Cabling and Connectors .....	18
5.3.1.	Cable Routing.....	18
5.3.3.	Connector Characteristics - Keying.....	19
5.3.4.	Connector Characteristics - Tools.....	19
5.3.5.	Container/Transport Case Cable Entry Panels .....	19
5.4.	Cable/Wiring Protection.....	19
5.4.1.	Cables/Wires Identification. ....	19
5.4.2.	Cables/Wires Identification Commonality.....	19
5.4.3.	Cables Protection from Sharp Edges.....	19

5.4.6.	Cables Heat Protection .....	19
5.4.7.	Cable Tension .....	19
5.4.9.	Spring-Loaded Clamp connections .....	20
5.4.14.	Cable Strain Relief .....	20
5.4.15.	Strain Relief Location .....	20
5.5.	Electromagnetic Interference and Electromagnetic Radiation .....	20
5.5.1.	Conducted Emission Levels of DI Cables .....	20
5.5.2.	Conducted Susceptibility Levels of DI Cables (Air Force) .....	20
5.5.3.	Conducted Susceptibility Levels of DI Cables (Army) .....	20
5.5.4.	Radiated Emission Levels .....	20
5.5.5.	DI Equipment Radiated Emission Levels .....	21
5.5.6.	Radiated Susceptibility Levels – Table Ground (Air Force) .....	21
5.5.7.	Radiated Susceptibility Levels – Table Ground (Army) .....	21
5.5.8.	European Community EMI Conformity for COTS Items – CE Marking .....	21
5.5.9.	European Community EMI Conformity for COTS Items - Declaration .....	21
5.5.10.	EMI Self-Compatibility .....	21
5.6.	Nameplates and Product Markings .....	21
5.6.1.	Item Markings .....	21
5.6.2.	Bar Code .....	21
5.6.3.	Visibility of Item Markings .....	21
5.6.4.	Characteristics of Markings .....	21
5.6.5.	Panel Markings .....	21
5.6.6.	Marking of Sensitive Parts .....	22
5.6.7.	Identification of Removable Cables .....	22
5.6.8.	Cable Conductor Identification .....	22
5.6.9.	Information Provided on Nameplate .....	22
5.6.10.	Updating of Nameplate Information .....	22
5.6.11.	Nameplate Attachment .....	22
5.6.12.	Nameplate Labelling Standard .....	22
5.6.13.	Item Labelling .....	22
5.6.14.	Marking of Packaging and Containers .....	22
5.7.	Interchangeability .....	22
5.7.1.	Interchangeability .....	22
5.7.2.	Interchangeability of Items .....	22
5.7.3.	Adjustments on Replacement .....	23
6.	Container Design Requirements .....	23
6.1.	Container Design .....	23
6.1.1.	Container Design .....	23
6.1.2.	International Convention for Safe Containers (CSC) .....	23
6.1.3.	Container Ground Clearance .....	23
6.2.	Container identification, Coding and marking .....	23
6.2.1.	Container Nameplate .....	23
6.2.2.	Container Identification Marking .....	23
6.2.3.	Container Characteristics Marking .....	23
6.2.5.	Customs Markings .....	23
6.3.	Delamination and Voids .....	23
6.3.1.	Number of Delaminations and Voids .....	24
6.3.2.	Delaminations and Void Size .....	24
6.4.	Impact Resistance .....	24
6.4.1.	Impact Performance .....	24
6.5.	Riveting .....	24
6.5.1.	Rivet Looseness .....	24
6.5.2.	Rivet Heads Mutilation .....	24
6.5.3.	Countersunk Heads .....	24
6.5.4.	Mating Surface Being Riveted - Damage .....	24
6.5.5.	Mating Surface Being Riveted - Distortion .....	24
6.5.6.	Foreign Material between Riveted Surfaces .....	24
6.6.	Welding .....	24
6.6.1.	Surfaces Welded .....	24
6.6.2.	Weld Quality Defects .....	24



6.6.3. Welded Joints .....	25
6.6.4. Welded Assemblies .....	25
6.7. Air and Water tightness .....	25
6.7.1. Water Tightness.....	25
6.7.2. Air Tightness Performance .....	25
6.7.3. Immersion.....	25
6.8. Roof .....	25
6.8.1. Roof Load .....	25
6.9. Floor.....	25
6.9.1. Floor Load - Distributed .....	25
6.9.2. Floor Load - Concentrated .....	25
6.9.3. Wall Load.....	25
6.10. Container Performance .....	25
6.10.1. Drop Test.....	25
6.10.2. Raised Drop Test.....	26
6.11. Door & Locking.....	26
6.11.1. Door Opening .....	26
6.11.2. Door Dimensions .....	26
6.11.3. Door Closing Device .....	26
6.11.4. Door Close Device Handle.....	26
6.11.5. Door Handle Torque .....	26
6.11.6. Door Padlock .....	26
6.11.7. Door Keypad Entry .....	26
6.11.8. Keypad Entry Bypass .....	26
6.11.9. Emergency Opening of Door .....	26
6.11.10. Door Holder.....	26
6.11.11. Door Protection .....	26
6.12. Access to the Roof .....	26
6.12.1. Roof Access .....	26
6.12.2. Roof Handhold.....	27
6.12.3. Roof Safety Harness Attachment Points.....	27
6.13. Overpressure .....	27
6.13.1. Container Overpressure.....	27
6.14. Drain .....	27
6.14.1. Drain Hole.....	27
6.14.2. Drain Hole Plug.....	27
6.15. Heat Transfer Coefficient .....	27
6.15.1. Container Temperature Differential.....	27
6.16. Transport by Air.....	27
6.16.1. Crash Landing .....	27
6.17. Fork Lift Pockets .....	27
6.17.1. Fork Lift Pockets.....	28
6.18. Stacking .....	28
6.18.1. Stacking.....	28
6.19. Exterior.....	28
6.19.1. Roof Coating.....	28
6.19.2. Exterior Floor Coating.....	28
6.20. Interior .....	28
6.20.1. Interior Painting - Ceiling.....	28
6.20.2. Interior Painting - Walls.....	28
6.20.3. Plastic Inner Skins .....	28
6.21. Flooring .....	28
6.21.1. Floor Covering .....	28
6.21.2. Floor Covering – Slip Resistance.....	28
6.21.3. Floor Covering – Electrical Resistance .....	28
6.21.4. Floor Covering - Antistatic.....	28
6.22. Data Plate .....	28
6.22.1. Data Plate – Transportation Data.....	28
6.22.2. Data Plate – Dimensions Data.....	28
6.22.3. Data Plate Material .....	29

6.23. Ancillaries.....	29
6.23.1. Number of Fire Extinguishers .....	29
6.23.2. Location of Fire Extinguishers.....	29
6.23.3. First Aid Kit .....	29
6.23.4. First Aid kit Mounting .....	29
6.23.5. Container Repair Kit .....	29
6.23.6. Container Repair Kit Contents .....	29
6.23.7. Container Repair Kit Mounting .....	29
7. Electrical Requirements .....	29
7.1. Power Supply Requirements .....	29
7.1.1. European Union (EU) regulations .....	29
7.1.2. Electro-Magnetic Compatibility .....	29
7.1.3. Equipment Supply.....	29
7.1.4. Power Fluctuations – Steady State Conditions .....	29
7.1.5. Power Fluctuations – Transient State Voltage Amplitude .....	30
7.1.6. Power Fluctuations – Transient State Frequency Amplitude.....	30
7.1.7. Power Fluctuations – Transient State Maximum Amplitude Duration.....	30
7.1.8. Power Fluctuations – Transient State Recovery Time .....	30
7.1.9. Power Fluctuations – Power Interruption .....	30
7.1.10. Power Fluctuations – Power Outage.....	30
7.1.11. Peak Transient Currents .....	30
7.1.12. Power Factor .....	30
7.1.13. Load Balancing between Phases.....	30
7.2. Power Entry and distribution.....	31
7.2.1. Power Entry .....	31
7.2.8. Power Entry Panel .....	31
7.2.11. Power Filters.....	31
7.2.12. Uninterrupted Power Supply .....	31
7.2.19. 125 Power Cable .....	32
7.2.23. Cabinet PDUs.....	32
7.2.28. Current Overload Protection .....	33
7.3. Earthing.....	33
7.3.1. Secure Earthing System .....	33
7.3.2. Earth Connection .....	33
7.4. Earth Rods .....	33
7.4.1. Earth Rods.....	33
7.4.2. Earth Rod Type.....	33
7.4.3. Earth Rod Straps .....	33
7.5. Electrical Safety .....	33
7.5.1. Protection from Electrical Potentials .....	33
7.5.2. Protection from Electrical Power .....	33
7.5.3. Supply Interlocks – By-passable .....	33
7.5.4. Resistance to Earth - Connection to Earth.....	33
7.5.5. Resistance to Earth – Exposed Metal .....	34
7.5.6. ELCBs .....	34
7.5.8. Touch Protection – Wiring Cabinets.....	34
8. Survivability Requirements .....	34
8.1. Infrared/Thermal Emissions.....	34
8.1.1. Exhaust Airflow.....	34
8.1.2. Horizontal Surfaces .....	34
8.1.3. Temperature Hot Spots.....	34
8.1.4. Signature High Contrast Characteristics .....	34
8.1.5. Thermal Signature – Large Areas .....	34
8.1.6. Anti-Infrared Paint.....	34
8.2. Acoustic Noise .....	35
8.2.1. Acoustic Noise .....	35
8.3. Fire Precautions .....	35
8.3.1. Fire Extinguishers .....	35
8.3.2. Fire Extinguishers location.....	35
8.4. Camouflage Nets .....	35

8.4.1. Camouflage Nets .....	35
8.5. Blackout Lighting .....	35
8.5.1. Blackout Lighting .....	35
8.5.2. Blackout Lighting Activation .....	35
9. HVAC and CBRN Protection Requirements .....	35
9.1. Heating, Ventilation and Air Conditioning (HVAC) Equipment Requirements .....	35
9.1.1. Forced Air Outlets Protection .....	36
9.1.2. Dust Filters .....	36
9.1.3. Replacement of Air Filters.....	36
9.1.4. Thermal Alarm .....	36
9.1.5. Thermal Alarm - Disable .....	36
9.1.6. Thermal Alarm - Reactivation .....	36
9.1.7. Minimum External Air Circulation.....	36
9.2. CB Filter.....	36
9.2.1. Anti-Blast Valve .....	36
9.2.2. Particle and Aerosol Filter.....	36
9.2.3. Charcoal Filter .....	36
9.2.4. Fan .....	36
9.2.5. Bypass Valve.....	37
9.2.6. Overpressure Valve.....	37
9.2.7. Pressure Meter .....	37
9.2.8. Control Panel.....	37
9.3. Anti-Blast Valve.....	37
9.3.1. Anti-blast Valve Mounting .....	37
9.3.2. Anti-blast Valve Performance .....	37
9.4. Particle and Aerosol Filter .....	37
9.4.1. Filter Performance with Aerosols .....	37
9.4.2. Filter Performance with Particles .....	37
9.4.3. Particle and Aerosol Filter Protection.....	37
9.5. Active Charcoal Filter .....	37
9.5.1. Filter Performance - Non-persistent Agents.....	37
9.5.2. Filter Performance - Persistent or Semi-persistent Agents.....	37
9.5.3. Filter Performance - Conventional Non-persistent Agent.....	37
9.6. Fan.....	38
9.6.1. Fan performance – Pressure Drop.....	38
9.6.2. Fan performance - Overpressure.....	38
9.6.3. Fan Design .....	38
9.7. By-pass Valve .....	38
9.7.1. By-pass Valve Operation .....	38
9.8. Over-Pressure Valve.....	38
9.8.1. Over-pressure Valve Mounting .....	38
9.8.2. Over-pressure Valve Performance.....	38
9.9. Pressure Meter and Alarm.....	38
9.9.1. Pressure Meter Indication.....	38
9.9.2. Pressure Meter Alarm .....	38
9.10. Installation .....	38
9.10.1. Fresh Air Inlet Protection .....	38
9.10.2. Anti-Blast Valve Protection .....	38
9.11. Maintenance.....	38
9.11.1. Anti-blast Valve Maintenance .....	38
9.11.2. Particle and Aerosol Filter Life .....	38
9.11.3. Active Charcoal Filter Life .....	39
9.11.4. Spare Filters .....	39
9.12. Replacement of Contaminated Filters .....	39
9.12.1. Replacement of Contaminated Filters.....	39
9.13. Special Air Conditioner Requirements.....	39
9.13.1. Air Conditioner Design.....	39
9.13.2. Decontamination of Air Conditioner .....	39
9.14. Construction .....	39
9.14.1. Installation .....	39

9.14.2. HVAC Inlet and Outlet Position .....	39
9.14.3. HVAC Condensation .....	39
9.15. HVAC Performance .....	39
9.15.1. Readiness .....	39
9.15.2. Condition Maintenance .....	40
9.15.3. Environmental Range .....	40
9.15.4. Control Granularity .....	40
9.15.5. Air Conditioner Over Pressure .....	40
10. Safety Requirements .....	40
10.1. General .....	40
10.1.1. Safety of Electronic Equipment .....	40
10.1.2. Use of hazardous materials .....	40
10.1.3. Hazard Warning Labels .....	40
10.1.4. Production of Toxic or Corrosive Fumes .....	40
10.1.5. Non-Combustible Materials .....	40
10.1.6. Fungus Inert Materials .....	41
10.1.7. Fungus Nutrient Materials .....	41
10.1.8. Ozone Concentration .....	41
10.1.9. Asbestos Materials .....	41
10.1.10. Glass Fibre Materials .....	41
10.2. Mechanical .....	41
10.2.1. Moving Part Protection .....	41
10.2.2. Equipment Edges Size .....	41
10.2.4. Fire Extinguisher Markings .....	41
10.3. Deployment Tools .....	41
10.3.1. Shovel, Sledgehammer and Pickaxe .....	41
10.3.2. Shovel, Sledgehammer and Pickaxe Storage .....	41
11. Human Factors Requirements .....	41
11.1. Audio Alarms .....	42
11.2. Controls .....	42
11.3. Visual Displays .....	42
11.4. Noise Level Prominent Tones .....	42
Appendix C Equipment/Cabinet Layout .....	43
Appendix D Additional Equipment .....	44
1. Rack Mount Equipment .....	44
2. Container-mounted Equipment .....	44
3. Ancillary items .....	45
4. Item Descriptions .....	45
Appendix E Cable Plan .....	48
Appendix F Equipment List .....	49
Appendix G Cable Vault .....	50
Appendix H Technical Documentation .....	51
Appendix I Verification Cross Reference Matrix .....	52
Appendix J List of Abbreviations .....	65

## 1 Introduction

The document provides the technical specifications for the two shelters, the Shelter Butting Kit (SBK) and the Contamination Control Area Tents (CCAT).

## 2 Document References

The following documents are referenced in this SOW and apply to specific requirements of the SUP:

Document Number	Document Title	Revision/Date
EN 1081E	Resilient, laminate and modular multilayer floor coverings - Determination of the electrical resistance	March 2019
IEC 60364	Electrical Installations for Buildings	Most recent version at CA time.
IEC 62305	Protection against Lightning	Edition 2 25-Jan-2013
ISO 1996	Acoustics — Description, measurement and assessment of environmental noise	2016/2017
ISO 6346	Coding, Identification and Marking of Shipping Containers	Nov-1995
ISO 10874	Resilient, Textile and Laminant Floor	Edition 1 Nov-2009
Mil-HDBK-419A	Ground, Bonding, and Shielding for Electronic Equipment and Facilities	29-Dec-1987
MIL-STD-130	Identification Marking of U.S. Military Property	Revision N Nov-2012
MIL-STD-171	Finishing of Wood Surfaces and Metals	Revision F May-2011
MIL-STD-461	REQUIREMENTS FOR THE CONTROL OF ELECTROMAGNETIC INTERFERENCE CHARACTERISTICS OF SUBSYSTEMS AND EQUIPMENT	Revision G 10-Dec-2007
MIL-STD-889	Dissimilar Metals	Revision C 22-Aug-2016
MIL-STD-1472	Human Engineering, Design Criteria For Military Systems, Equipment, And Facilities	Revision F 11-Jan-2012
SDIP-29	Installation of Electrical Equipment for the Processing of Classified Information	Revision 2 Mar-2015
STANAG 2338	NATO Infra-Red Reflective (IRR) Green Colour for Painting Military Equipment	1 Jan 1974
STANAG 4280	NATO Levels of Packaging	08 Feb 1999
STANAG 4281	NATO STANDARD MARKING FOR SHIPMENT AND STORAGE	4 Oct 2016
STANAG 4319	Countersurveillance Requirements for Future Main Battle Tanks Infrared/Thermal Aspects	18 Nov 1991
STANAG 4329	NATO Standard Bar Code Symbolologies	8 Dec 2004
STANAG 4370	Environmental Testing	Edition 3 dated Feb 2008

# Appendix A Functional Requirements

## 1. CIS Equipment Container

### *(DSU-FU-1) Shelter Production*

The SUP Shelter shall be a 20x8x8-foot ISO Sea Container, equipped to house 6 19" Cabinets for CIS and communications equipment.

### *(DSU-FU-2) Equipment Provisioning*

The SUP shelter shall be equipped with HVAC equipment to support operation and storage.

### *(DSU-FU-3) Transportation*

The SUP Shelter shall be capable of being transported, using a commercial trailer, sea transport, or military airlift.

### *(DSU-FU-4) Equipment Installation*

Installation of equipment shall be i.a.w.SDIP-29 for the TEMPEST level class defined in the SOW.

### *(DSU-FU-5) Fire Alarm System*

The shelters shall be equipped with a Fire Alarm System, with audible and visual alarms inside and outside the shelter.

### *(DSU-FU-6) Alarms*

The shelter shall be equipped with visual alarms inside and outside for the following equipment:

- Electric Power
- UPS state
- Temperature
- Humidity
- HVAC Performance

## 2. 19" Equipment Cabinets

### *(DSU-FU-7) Cabinet Width*

There shall be six 19" equipment cabinets inside each of the containers.

### *(DSU-FU-8) Cabinet Height*

Each cabinet shall have a usable capacity of at least 36U, utilizing available container space (floor to ceiling) to the maximum extent.

### *(DSU-FU-9) Cabinet Rail*

Each Cabinet shall be equipped with mounting rails in the front and in the back.

### *(DSU-FU-10) Cabinet Fitting*

The cabinets shall be designed in such a way that all described equipment, including purchaser-listed equipment (Appendix F) can be mounted at any rack position with a minimum depth of 1.20 m.

### *(DSU-FU-11) Cabinet Label*

The cabinets shall be labelled as follows:

Red Cabinet 1	NS1
Red Cabinet 2	NS2
Red Cabinet 3	Comsec
Red Cabinet 4	NC
Black Cabinet 1	NU1
Black Cabinet 2	NU2

**Table 1 Equipment cabinets**

### 3. Cable Access Vaults

#### *(DSU-FU-12) Cable Vault*

The shelter shall have two access vaults, one for power and ground connections, and one other for data connections and antenna cables. The exact connector requirement is described in Appendix G

### 4. Cabling

#### *(DSU-FU-13) Data Cable Installation*

The contractor shall install data cables as described in Appendix E

#### *(DSU-FU-14) Secure Cable Installation*

Cables shall be secured using cable conduits, cable holders or cable ties.

#### *(DSU-FU-15) Cable Ties*

Velcro cable ties shall be used to simplify reconfiguration.

#### *(DSU-FU-16) Cable Ducting*

Cable Ducting shall be in the overhead.

#### *(DSU-FU-17) Cable Ducts*

There shall be sufficient Cable ducts to be in compliance with SDIP29.

### 5. Physical Installation and Integration

#### *(DSU-FU-18) Equipment Suitability*

The Contractor shall analyse the suitability of all equipment in Appendix F for installation into the shelters as described in Appendix C page 4 and 5 under all operating conditions (operation, storage and transportation – see Appendix B) and provide a report highlighting any deficiency.

#### *(DSU-FU-19) Equipment Installation*

The Contractor shall purchase and install all equipment listed in Appendix D into the shelters.

#### *(DSU-FU-20) Blanking Panels*

The contractor shall cover all empty slots with blanking panels in the front of the cabinets.

*(DSU-FU-21) Power Distribution Installation*

The contractor shall install the Power distribution equipment, which are presented in Appendix C page 7 into the shelters.

*(DSU-FU-22) Power Cables*

The Contractor shall install power Cables for all installed equipment.

## 6. Shelter Butting Kits and Contamination Control Area Tents

### 6.1. Introduction

*(DSU-FU-23) SBK and CCAT*

The SUP Shelter, hereafter referred to as the "Shelters" shall be equipped with Shelter Butting Kits (SBK) and Contamination Control Area Tents (CCAT).

### 6.2. General requirements

*(DSU-FU-24) SBK and CCAT Unit*

An individual SBK or CCAT "unit" shall comprise all materials, fittings and fixtures not already included in the SUP Shelters and the DARS Shelters.

*(DSU-FU-25) Shelter Connection*

The SBK and CCAT shall be capable of being attached to any SUP Shelter door and DARS Operations shelter doorway without interruption to the operation of the door.

*(DSU-FU-26) SBK and CCAT Integrity*

The SBK and CCAT when fitted, shall maintain the integrity of the shelter environment during Biologically/Chemically (BC) hostile conditions and non-BC conditions.

*(DSU-FU-27) SBK and CCAT Setup and Teardown*

The SBK and CCAT shall be capable of setup/teardown and operation in the environmental specifications detailed in Appendix B.

*(DSU-FU-28) SBK and CCAT Transportation*

The SBK and CCAT shall be capable of Transportation as detailed in Appendix B.

*(DSU-FU-29) SBK and CCAT Portability*

The SBK and CCAT shall comply with the Physical Portability requirements as detailed in Appendix B.

*(DSU-FU-30) SBK and CCAT Isolation*

The SBK and CCAT construction shall include thermal insulating material.

*(DSU-FU-31) SBK and CCAT Colour*

The SBK and CCAT exterior colour shall RAL6022.

*(DSU-FU-32) SBK and CCAT Gas-proof*

The SBK and CCAT shall be constructed from gas-proof materials that can be de-contaminated in field conditions.

*(DSU-FU-33) SBK and CCAT Setup Tools*

The SBK and CCAT shall not require special-to-type tools or equipment (other than those delivered with the DARS) for set-up or tear-down.



*(DSU-FU-34) SBK and CCAT Terrain Installation and Operation*

The SBK and CCAT shall be capable of setup/tear-down and operation on 'green field' or 'hard standing' sites, including gravel, snow and sand.

*(DSU-FU-35) SBK and CCAT Transport Cases/bags*

The SBK and CCAT shall be supplied with Transport Cases/bags for transport and storage.

**6.3. Shelter Butting Kit***(DSU-FU-36) SBK Interconnection*

The SBKs shall provide the ability to interconnect any SUP Shelter to any DARS Operations shelters.

*(DSU-FU-37) SBK Setup and Teardown*

A SBK shall be capable of setup or tear-down under all specified conditions, within a period of 1 hour with a maximum of 4 trained personnel wearing BC Personal Protective Equipment (PPE).

*(DSU-FU-38) SBK Extendable Platform*

The SBK shall be supplied with a non-slip extendable platform to allow operation when shelter is directly on ground, raised<sup>1</sup> on mobilisers, shelter mobilising wheels or on a stopped transporter (e.g. truck or trailer).

*(DSU-FU-39) SBK and shelter alignments*

The SBK shall be capable of operation when shelter alignments (in any dimension) differ by up to  $\pm 25$  mm.

*(DSU-FU-40) SBK Length*

The SBK shall be a minimum of 1.8M in length.

*(DSU-FU-41) SBK Inter-changeability*

All SBKs shall be identical and inter-changeable.

**6.4. Contamination Control Area Tents***(DSU-FU-42) CCAT Entrance*

The CCAT shall be a single entry device i.e. with one entrance doorway connecting to a SUP shelter door.

*(DSU-FU-43) CCAT Setup and Teardown*

A CCAT shall be capable of setup or teardown under all specified conditions, within a period of 2 hours with a maximum of 4 trained personnel wearing BC PPE.

*(DSU-FU-44) CCAT Identical*

All CCATs shall be identical.

*(DSU-FU-45) CCAT Operation*

The CCAT shall be capable of operation when the shelter is directly on ground, raised<sup>1</sup> on mobilisers, shelter mobilising wheels, jacks or stopped transporter (e.g. truck or

---

<sup>1</sup> When raised, the mobiliser/transport will be 'chocked' to prevent movement stressing the SBK or CCAT

trailer), when the bottom of the shelter door varies in height by up to 0.4m above ground level of the CCAT.

*(DSU-FU-46) CCAT Components*

The CCAT shall comprise two components:-

- Penthouse; The outer penthouse tent.
- Airlock; The removable internal airlock system.

6.4.1. Penthouse

*(DSU-FU-47) CCAT Penthouse Airlock*

The CCAT penthouse shall accommodate the removable airlock.

*(DSU-FU-48) CCAT Penthouse Size*

The CCAT penthouse shall be sized to include the airlock, any airlock ancillary equipment, a waiting area for a minimum of 2 personnel and space for the connection to the DARS shelter.

*(DSU-FU-49) CCAT Penthouse Space*

The area shall be of sufficient size to allow the shelter entrance doors to be opened.

*(DSU-FU-50) CCAT Weather Proof Entrance*

The CCAT penthouse shall be capable of use without the Airlock components, to provide a simple weather proof entrance to the DARS shelter.

*(DSU-FU-51) CCAT Cover Sheet*

The CCAT penthouse shall be provided with an additional alternative cover sheet to allow use as a simple weatherproof (i.e. BC protection not required) entrance.

6.4.2. Airlock

*(DSU-FU-52) Airlock Chambers*

The airlock shall be made up of two chambers.

- 1<sup>st</sup> Chamber

*(DSU-FU-53) Chamber 1 Personnel size*

A minimum of 2 Personnel shall be able to pass into the chamber at the first stage of entry into the shelter.

*(DSU-FU-54) Chamber 1 Space*

There shall be sufficient space to conduct “buddy-buddy” de-contamination (using Fullers<sup>2</sup> earth or similar) before passing into the next chamber.

- 2<sup>nd</sup> Chamber

*(DSU-FU-55) Chamber 2 Personnel Size*

---

<sup>2</sup> Fullers Earth is not part of this contract

The chamber shall permit a minimum of 2 decontaminated occupants to wait whilst air changes occur before personnel can pass through into the Shelter.

*(DSU-FU-56) Chamber 2 Space*

The area shall be of sufficient size to allow enough room for the shelter entrance doors to be opened.

## Appendix B Non-functional Requirements

### 1. Definitions

#### 1.1. Commercial Off The Shelf (COTS)

Commercial Off The Shelf (COTS) hardware is defined as an item that meets all the following criteria:

- has been developed for general commercial use,
- is available to the market within any NATO member nation
- is legally maintained by a manufacturer/vendor.

#### 1.2. Developed Item (DI)

Developed Item (DI) hardware is defined as an item that does not meet the requirements of COTS Hardware. Developed hardware includes hardware, such as wiring required to integrate COTS Hardware. Any modifications to COTS hardware is considered to be developed hardware.

#### 1.3. Line Replaceable Unit (LRU)

A Line Replaceable Item (LRU) is defined as a part of a main equipment that has the following characteristics:-

- failure can be detected and indicated by a Built-in Test (BIT) system, in conjunction with technical manuals and general-purpose test equipment;
- easily accessed for replacement purposes;
- easy to replace, through the use of a plug-in connector, screwed terminals or similar connectors;
- minimal adjustment requirements, such as voltage level settings. Adjustments may be carried out with the BIT system or with general purpose tools and test equipment;
- when only one LRU has failed, its replacement returns the system to full operational status within a given meantime from the time of failure.
- replaced by the least skilled maintainer, trained to the lowest maintenance level using the smallest amount of tools and test equipment.

### 2. Characteristics of Deployable Entities (CODE) Requirements

The DARS Security Upgrade Shelters will meet the following requirements:

#### 2.1. Environmental requirements

Deployable entities will be capable of Operation, Transport, Storage and Maintenance within a variety of Natural and Induced environments. The Environmental requirements are detailed in Section 3 (Environmental Requirements) and includes requirements to meet climatic zones A1, A2, A3, B1, B2, B3, C0, C1, M1 & M2 of STANAG 4370 and exposure to wind, rain, snow and ice, lightning, shock, vibration, dust and water penetration, salt mist, acid atmosphere, mould resistance and contaminant fluid damage. The Environmental Requirements are detailed in Section 3 (Environmental Requirements).

#### 2.2. Transportation Requirements

The deployable entities will be capable of transportation by a variety of means. The Transportation Requirements are detailed in Section 4.14. (Transportation Requirements) and include requirements for transportation via road, off-road, rail, canal, sea and via air in C130 or under-slung load by military helicopter (CH-47 Chinook).

### 2.3. Physical Portability Requirements

Any parts of the deployable system intended for movement by hand, will be subject to the Physical Portability requirements; defining one or multi-person weight limits, repetitive lifting, weight limits relative to object size, weight limits in relation to obstacles, labelling and lifting points. The requirements are detailed in Section **Error! Reference source not found.** 4.2 (Physical Portability Requirements).

### 2.4. Design & Construction Requirements

Deployable entities will meet Design & Construction Requirements that include use of materials, general construction, cabling and connectors, ventilation and cooling of equipment, electromagnetic interference and electromagnetic radiation, nameplates and product markings, workmanship, inter-changeability, safety, human engineering and system security. The requirements are defined in Section 5 (Design & Construction Requirements). Container Design Requirements

Deployable entities requiring a Container to protect equipment and/or manpower will meet the Container Design Requirements as detailed in Section 6 (Container Design Requirements). The requirements include cabling and wiring, panel construction and strength, riveting, welding, air and water tightness, drainage, roof and floor loading, door attributes, roof access, finish etc..

### 2.5. Electrical Requirements

Deployable entities will meet European Electrical safety regulations and guidelines. The Electrical Requirements are detailed in Section 7 (Electrical Requirements).

### 2.6. Survivability Requirements

Deployable entities will meet a set of Survivability Requirements as detailed in Section **Error! Reference source not found.** 8 (Survivability Requirements). The requirements define a level of Acoustic and Thermal signature reduction .

### 2.7. HVAC and CBRN Requirements

The deployable system is required to provide suitable HVAC and CBRN to protect manpower across the range of environmental requirements and in hostile CBRN conditions. The detailed requirements are contained in Section 9 (HVAC & CBRN Requirements) and include definition of temperature & humidity range, pressure, warning alarms etc.

### 2.8. Safety Requirements

Deployable entities have to make sure they will be use safely with regards to electronic equipment, hazardous material toxic and corrosive fumes, non-combustible materials, fungus, ozone concentration, asbestos, glass fibre, mechanical and deployment tools. The Safety Requirements are detailed in Section 10 (Safety Requirements).

### 2.9. Human Factors Requirements

The deployable system is required to provide an environment meeting the Human Factors Requirements as defined in Section 10 (Human Factors Requirements).

## 3. Environmental Requirements

### 3.1. Natural Environmental Conditions

## 3.1.1. Climatic Zones - Operation

(DSU-NF-1) The system shall be capable of Operation without degradation in Climatic Zones A1, A2, A3, B1, B2, B3, C0, C1, M1 & M2 as specified in STANAG 4370.

## 3.1.2. Climatic Zones - Transport

(DSU-NF-2) The system shall be capable of Transportation without degradation in Climatic Zones A1, A2, A3, B1, B2, B3, C0, C1, M1 & M2 as specified in STANAG 4370.

## 3.1.3. Climatic Zones - Storage

(DSU-NF-3) The system shall be capable of Storage (for a period up to 5 years) without degradation in Climatic Zones A1, A2, A3, B1, B2, B3, C0, C1, M1 & M2 as specified in STANAG 4370.

## 3.1.4. Climatic Zones - Maintenance

(DSU-NF-4) The system shall be capable of Maintenance without degradation in Climatic Zones A1, A2, A3, B1, B2, B3, C0, C1, M1 & M2 as specified in STANAG 4370.

## 3.1.5. Change of Temperature (Temperature Shock)

(DSU-NF-5) The system shall be capable of Operation, Transport and Storage without degradation, under the following changes of temperature:

- 0.05°C/Minute for climatic zones A1, A2 & A3
- 0.04°C/Minute for climatic zones B2, B3, C0, C1 and M4
- 0.03°C/Minute for climatic zone B1
- 0.06°C/Minute for climatic zone M1

## 3.1.6. Lightning

(DSU-NF-6) Lightning Protection

The system shall include a Lightning Protection system in accordance with the International Standard for Lightning Protection (IEC 62305) taking account of the deployable characteristics of the system and assuming a deployment location remote from other structures and without ground or overhead power lines.

(DSU-NF-7) Lightning Protection Components

The system shall include as a minimum the following measures in the Lightning Protection System:

- Air Terminations (e.g. Masts and Rods)
- Surge & Spike Protection Devices (e.g. Gas Discharge Tubes)
- Down-Conductors & bonding

## 3.1.7. Air Pressure Range

(DSU-NF-8) Storage (for a period up to 5 years) and Maintenance without degradation with Air pressure range, 55-109 kPa,

## 3.1.8. Wind Speed Operation and Maintenance

(DSU-NF-9) The system shall be capable of Operation and Maintenance without degradation, with a Steady Wind Speed maximum of 22 m/s and with gusts of 40 m/s for up to 5 s at repetition intervals of 10 s.

## 3.1.9. Wind Speed Transportation and Storage

(DSU-NF-10) The system shall be capable of Transportation and Storage (for a period up to 5 years) without degradation, with a Steady Wind Speed maximum of 22 m/s and with gusts of 40 m/s for up to 5 s at repetition intervals of 10 s.

#### 3.1.10. Wind Speed Survival

(DSU-NF-11) The system shall be capable of being placed in a Wind Speed Survival configuration to survive a Steady Wind Speed maximum of 28 m/s and gusts of 50 m/s for up to 5 s at repetition intervals of 10 s.

#### 3.1.11. Wind Speed Survival Preparation

(DSU-NF-12) The system shall be capable of being placed in a Wind Speed Survival configuration, within 30 minutes and restored to the preceding state, without degradation, within 30 minutes.

#### 3.1.12. Solar Radiation

(DSU-NF-13) The system shall be capable of Operation, Transportation, Storage (for a period up to 5 years) and Maintenance without degradation with Solar Radiation of 1130 W/m<sup>2</sup>.

#### 3.1.13. Rainfall

(DSU-NF-14) The system shall be capable of Operation, Transportation, Storage (for a period up to 5 years) and Maintenance without degradation with Rainfall of 2.38 mm/minute with peaks of 41.5 mm/minute.

#### 3.1.14. Salt Spray

(DSU-NF-15) The system shall be capable of Operation, Transportation and Storage for 168 hours in a salt spray of 25% of sodium chloride solution without visible damage or loss of strength or bonding.

#### 3.1.15. Snow Loading Operation and Maintenance

(DSU-NF-16) The system shall be capable of Operation, without degradation, with a snow loading up to 980 N/m<sup>2</sup>,

#### 3.1.16. Snow Loading Transportation and Storage

(DSU-NF-17) The system shall be capable of Transportation and Storage (for a period up to 5 years) without degradation, with a snow loading up to 3,660 N/m<sup>2</sup>,

#### 3.1.17. Ice Loading

(DSU-NF-18) The system shall be capable of Operation, with up to 17mm ice loading during operation and able to survive up to 37mm ice loading during Transportation and Storage (for a period up to 5 years),

#### 3.1.18. Hailstones

(DSU-NF-19) The system shall be capable of Operation, Transportation and Storage (for a period up to 5 years) with hailstones of up to 30 mm diameter, 0.9 g/cm<sup>3</sup> density and 58 m/s terminal velocity,

#### 3.1.19. Dust & Sand

(DSU-NF-20) The system shall be capable of Operation, Transportation and Storage (for a period of up to 5 years) in a dust/sand environment with particle size and concentration up to 2.0 g/m<sup>3</sup> of 150 µm and 1.0 g/m<sup>3</sup> of 20 µm particles with sedimentation rate as high as 2.0 g/m<sup>2</sup>/day and average particle hardness of 7 in the Mohs scale, occasionally reaching 9 on that scale.

#### 3.1.20. Gradient

(DSU-NF-21) The system shall be capable of Operation, Storage (for a period up to 5 years) and Maintenance without degradation, on ground that slopes in any direction at a gradient of 10°.

### 3.2. Induced Environmental Conditions

#### 3.2.1. Environmental Conditions in Air Transport

(DSU-NF-22) The system equipment, when packed, shall as a minimum withstand a pressure equivalent to the atmospheric air pressure at 10000 meters altitude according to the ICAO Standard Atmosphere.

#### 3.2.2. Environmental Conditions & Mechanical Constraints in Transport

(DSU-NF-23) Equipment, spare parts and consumables when packed for transportation i.a.w. the Contractor's packing instructions shall withstand, without degradation, the environmental conditions & Mechanical Constraints as specified in STANAG 4280, NATO packaging level 3 'Distribution'.

#### 3.2.3. Environmental Conditions & Mechanical Constraints in Storage

(DSU-NF-24) The system equipment, when packed for storage i.a.w. the Contractor's packing instructions shall withstand the environmental conditions & Mechanical Constraints, without degradation as specified in STANAG 4280, NATO packaging level 3 'Storage'.

#### 3.2.4. Securing of Items during Transportation

(DSU-NF-25) Items housed or used in/on the system shall be capable of being secured in or on the system to prevent damage during transportation.

### 3.3. Mechanical Requirements

#### 3.3.1. Inclination

(DSU-NF-26) The system shall be capable of Transportation and Storage without degradation following an inclination of 45 degrees in any orientation for a period of 1 hour.

#### 3.3.2. Shock

(DSU-NF-27) The system shall be capable of Operation, Transportation and Storage without degradation following exposure to the following conditions:

- 20 g, 11 ms, half sine mechanical shock for transport and storage.

#### 3.3.3. Vibration

(DSU-NF-28) The system shall be capable of Operation, Transportation and Storage without degradation following exposure to the following conditions:

- 5-20Hz 0.05 g<sup>2</sup>/Hz and 20-150 Hz-3dB/Oct (1.7 g rms) random vibration conditions for transport and storage.

#### 3.3.4. Acceleration

(DSU-NF-29) The system shall be capable of Transportation and Storage without degradation following exposure to the following conditions:

- ≤ 10g for transport
- ≤ 2g for storage



#### 3.3.5. Bump

(DSU-NF-30) The system shall be capable of Operation, Transportation and Storage without degradation following exposure to the following conditions:

- 40 g, 6 ms, 1000 pulses for transport and storage

#### 3.3.6. Drop and Topple

(DSU-NF-31) The system shall be capable of Operation, Transportation and Storage without degradation following exposure to the following conditions:

- 30° face and corner topple, on all faces & corners

#### 3.3.7. Free-Fall in Transport Cases

(DSU-NF-32) Any equipment housed in transport cases shall be capable of Operation, Transportation and Storage without degradation following exposure to vertical free-falls of the complete assembly from up to 500 mm when in the transportation configuration.

#### 3.3.8. IP Rating During Transport And Storage

(DSU-NF-33) The system shall comply with IEC 60529 IP65 (Protection against all dust penetration and against water jets from any direction) for transport and storage.

#### 3.3.9. IP Rating In Operation

(DSU-NF-34) The system shall comply with IEC 60529 IP54 (Protection against internal dust accumulation and against splashing water from any direction) when in operation.

#### 3.3.10. IP Rating Internal

(DSU-NF-35) Internally, Shelters shall be designed in such a way that, with equipment doors closed and protective covers installed, low-voltage electrical equipment is protected to IEC 60529 IP42

### 3.4. Biological and Chemical Requirements

#### 3.4.1. Salt Fog

(DSU-NF-36) The system shall withstand salt fog environments at a severity of up to 5%, concentration under all conditions.

#### 3.4.2. Acid Atmosphere

(DSU-NF-37) The system shall withstand occasional exposure to the acid rainfall conditions existing in heavily industrialized areas, or in the proximity of fuel burning machinery or vehicles' exhaust systems. AECTP 300 Method 319 Test Duration Severity 'A' applies.

#### 3.4.3. Contamination by Fluids

(DSU-NF-38) The system shall withstand occasional contamination by exposure to the contaminant fluids listed in AECTP 300 Method 314 Table I

#### 3.4.4. Decontamination

(DSU-NF-39) Decontamination of all exposed external surfaces shall be possible.

#### 3.4.5. Mould Growth in Operation

(DSU-NF-40) The system shall withstand, without degradation, contamination by the fungal species listed in Table 1 of AECTP300 test method 308, manifesting as:

- "Trace" (scattered, sparse or very restricted microbial growth) for outdoor, equipment, unless it can be proven that mould growth does not impair device performance.
- "Light" (intermittent manifestations or loosely spread microbial colonies on substrate surface. Includes continuous filamentous growth extending over the entire surface, but underlying surfaces are still visible) for outdoor exposed enclosures, cables and other equipment.

#### 3.4.6. Mould Growth during Storage and Transport

(DSU-NF-41) While packaged for storage and transport, the system shall withstand, without degradation, contamination by the fungal species listed in Table 1 of AECTP300 test method 308 manifesting as "Medium" (substantial amount of microbial growth. Substrate may exhibit visible structural change) growth severity.

## 4. Transportation

### 4.1. Transportation Requirements

#### 4.1.1. Road Transportation – Prime Mover Equipment

(DSU-NF-42) The Deployable shelter shall be capable of operation without degradation after being transported on road or off-road by the prime mover equipment.

#### 4.1.2. Road Transportation – Flat Bed

(DSU-NF-43) The Deployable shelter shall be capable of operation without degradation after being transported on road by truck flat load bed.

#### 4.1.3. Rail Transportation

(DSU-NF-44) The Deployable shelter shall be capable of operation without degradation after being transported on rails by standard European rail flat-cars

#### 4.1.4. Water Transportation

(DSU-NF-45) The Deployable shelter shall be capable of operation without degradation after being transported on water by canal barge and ocean going ships.

#### 4.1.5. ISO Corner Handling Equipment

(DSU-NF-46) The Deployable shelter shall implement ISO corners in accordance with ISO 6346.

#### 4.1.6. ISO Corner Ground Clearance

(DSU-NF-47) The deployable shelter shall have a ground clearance of 12.5mm (minimum) between the base of the container and the ISO corner base.

#### 4.1.7. Shelter Deployment via ISO Container

(DSU-NF-48) The Deployable shelter shall be capable of operation without degradation after being transported via ISO container handling equipment utilising top lifting and end loading mechanisms.

#### 4.1.8. Transport by Transport Aircraft

(DSU-NF-49) The Deployable shelter shall be capable of operation without degradation after being transported by military transport aircraft (including C-130 Hercules and Airbus A400M).

#### 4.1.9. Helicopter Underslung Load

(DSU-NF-50) The Deployable shelter shall be capable of operation without degradation after being transported as an under-slung load by military helicopter (including CH-47 Chinook; 12 tonnes maximum load) for components within lift capability.

#### 4.1.10. Shelter Roof Protection.

(DSU-NF-51) The roof of the Deployable shelter shall withstand the impact of a 4 kg shackle dropped from height of 1m for items above.

## 4.2. Physical Portability Requirements

Individual items, capable of man-portability (lifting & carrying) will be required to meet a set of requirements that define the maximum weights of items and incur reductions based upon the height of the lift, the number of lifters and obstacles encounters during lift.

### 4.2.1. Weight Limits for One-person Definition

The weight limits in Table 2 define the maximum weight applicable to a single person lift & carry.

### 4.2.2. Lift Frequency

The weight limits in Table 2 define limitations for repetitive lifting as found, e.g., in loading or unloading transport vehicles and deploying the system. Under these circumstances, a Lift Frequency (LF) in lifts/min is used to reduce maximum weights. E.g. for a LF of 6 lifts/min, the maximum permissible weight is reduced by 50% ( $8.33 \times 6 = 50$ ).

### 4.2.3. Obstacles

The values in Table 2 assume that there are no obstacles between the lifter and the shelf, table, bench or other surface on which the object is to be placed. Table 1.5.-2 identifies reductions in maximum weight applied with respect to obstacles.

### 4.2.4. Carry Distance

In all cases involving carrying, it is assumed that the object is first lifted from the floor and carried a distance of not more than 10 m.

### 4.2.5. Mass Distribution

The weight limits in Table 2 are applicable to an object with uniform mass distribution and a compact size of not more than 0.45 m high, 0.45 m wide and 0.3 m deep (away from the lifter's body). This places the hand holds at half the depth, or 0.15 m away from the lifter's body. Table 3 identifies reductions in maximum weight applied with respect to object size.

### 4.2.6. Weight Limits for One-person

(DSU-NF-52) Items designed for One-person lift & carry shall not exceed the maximum weight limits in Table 2 and conditions in Table 3. The values are applicable to objects with or without handles.

- (a) Lift object from the floor and place it less than 10m distant on a surface not greater than 1.5 m above the floor - Weight Limit 16kg.
- (b) Lift an object from the floor and place it less than 10m distant on a surface not greater than 0.9 m above the floor - Weight Limit 20kg.

**Table 2 Weights Limits**

- (c) Where it is not possible to define the height to which an object has to be lifted, the 1.5 m limit shall be used
- (d) The maximum weight of Items incurring a Lift Frequency (LF) of more than 1 lift/5 min or 20 lifts/8 h on a person shall be reduced by  $(8.33 \times \text{LF})\%$
- (e) Where there is a lower protruding shelf or other obstacle limiting the lifter's approach to the desired surface, the maximum permissible weight limit shall be reduced by 33% for an obstacle protruding 0.3 m, by 50% for an obstacle protruding 0.45 m, and by 66% for an obstacle protruding 0.6 m.
- (g) If the maximum allowable weight limit must be reduced by both oversize load considerations and obstacle considerations, then only the more restrictive single value shall apply; 2 reductions shall not be applied.
- (h) If the object depth is more than 0.6 m from the lifter, the maximum permissible weight limit shall be reduced by 33%.
- (i) If the object depth is more than 0.9 m from the lifter, the maximum permissible weight limit shall be reduced by 50%.
- (j) If the object depth is more than 1.2 m from the lifter, the maximum permissible weight limit shall be reduced by 66%.

**Table 3 Weight Reduction Conditions****4.2.7. Weight Limits for Two Persons**

(DSU-NF-53) Items designed for two-person lift shall not exceed Double the maximum weight limits in table 1.5.-1 and conditions in Table 1.5.-2, with each lift point not exceeding the single weight limit. The values are applicable to objects with or without handles,

**4.2.8. Weight Limits for Multiple Persons**

(DSU-NF-54) Items weighing more than a 2 person lift shall require no more than 75% of the one-person value in Table 1.5.-1 per additional lifter; the heavier lift load of non-uniformly distributed weight not exceeding the single weight limit in Table 1.5.-1 and conditions in Table 1.5.-2.

**4.2.9. Tools**

(DSU-NF-55) Systems requiring the use of specialist (e.g. hoists/cranes) or generic (e.g. Sack Truck) equipment or tools to enable the lift and carry of items during setup and deployment shall include the tools as a part of the complete deployable system if they are not already available at the DARS.

**4.2.10. Portability Tools**

(DSU-NF-56) Equipment and tools required to enable the lift and carry of any items, shall be provided as a part of the complete system if they are not already available at the DARS.

**4.2.11. Weight Labelling**

(DSU-NF-57) Items weighing more than the one-person values in Table 1.5.-1 shall be prominently labelled with the weight of the object and the lift limitation, e.g. two-person lift, three-person lift, mechanical lift.

**4.2.12. Special Lifting Points**

(DSU-NF-58) Where a mechanical or power lift is required, hoist and lift points shall be provided and clearly labelled to the type of lift required.

## 5. Design & Construction Requirements

### 5.1. Materials

The selection of materials should avoid toxic substances. Furthermore, materials should not significantly distort, discolour or change other properties during the specified life of the items when subjected to the range of environmental effects. The Contractor should use recyclable materials and should select printers and similar equipment that allow re-fill of cartridges for liquids and powders if system performance is not affected and costs are not increased. In case equipment is to be provided with glass or other transparent material surfaces, the Contractor should select, to the extent possible, COTS equipment with shatterproof and distortion-free glass or other transparent materials on surfaces..

#### 5.1.1. Specification of Electrical Cables

(DSU-NF-59) Cables shall be i.a.w. MIL-HDBK-454, Guidelines 65, 66, 76, 71 and 69 for coaxial, multi-conductor, fibre optic, inter-unit and internal wiring, respectively or i.a.w. an equivalent specification of an internationally recognised standardisation organisation or i.a.w. an equivalent internationally recognised commercial standard.

#### 5.1.2. Dissimilar Metal Selection

(DSU-NF-60) For DIs, the selection and protection of dissimilar metal combinations shall be i.a.w. MIL-STD-889, Table I, assuming an industrial atmosphere, and if the equipment is to be located such that it is exposed to a marine atmosphere, compatible with that environment.

#### 5.1.3. Corrosion Protection

(DSU-NF-61) Metals liable to corrosion, which are used on DIs, shall have the metal finishing treatment i.a.w. the MIL-STD-171 finishes listed below in Table 4 "Metal Finishing".

Material	Qualification	Finish	MIL-STD-171 Finish Number
Large ferrous items such as shelters, tractors etc.	Pre-treatment for painting	a. Abrasive blasting finish or b. Phosphoric acid cleaning, followed by wash primer	4.1 4.4 5.2
Steel	Final finish for Corrosion Resistance	Cadmium plating with supplementary chromate	1.1.2.3
Steel	Finish prior to painting	Zinc phosphate base	5.1.1
Large structural aluminium alloy items	Finish prior to painting	a. Chromate chemical film or b. Wash primer	7.3 5.2
Aluminium	Corrosion Resistance or pre-painting.	a. Chromic acid anodic film or b. Sulphuric acid anodic film	7.1.1 7.2.1

**Table 4 Metal Finishing**

### 5.2. Construction

#### 5.2.1. Modularity of Equipment

(DSU-NF-62) Equipment shall be modular; each module to be removed from the system for repair or any other off-equipment maintenance being a Line Replaceable Unit (LRU).

#### 5.2.2. Container Accessibility

(DSU-NF-63) Containers shall be designed in such a way that all equipment installed inside can be removed through the container doors, without the requirement to cut an additional access hole.

#### 5.2.3. Door-open Operation

(DSU-NF-64) The operating conditions of equipment and sub-components within cabinets shall be maintained, if doors are open for up to one hour for maintenance purposes.

#### 5.2.4. Equipment Lubrication

(DSU-NF-65) All moving parts and bearings used in the equipment shall be either permanently lubricated or not require re-lubrication more than once per year.

#### 5.2.5. Rigidity – LRU Exchange

(DSU-NF-66) The structural strength and rigidity of the cabinets and frames shall be such that handling and exchanging of LRUs does not result in any permanent deformation.

#### 5.2.6. Rigidity - Doors

(DSU-NF-67) The structural strength and rigidity of all cabinets shall be independent of any strength or rigidity provided by access doors.

#### 5.2.7. Cable Extenders and Retractors

(DSU-NF-68) Cable extenders and retractors and other cable management methods shall be provided for contractor-furnished equipment to allow for LRU diagnostics, replacement or accessibility and to ensure cables are not strained and are kept free and clear of the moving equipment.

#### 5.2.8. Access Doors Protection

(DSU-NF-69) Protection shall be provided to prevent damage to equipment caused by accidentally closing access doors while drawers are extended.

#### 5.2.9. Protection against Incorrect Location

(DSU-NF-70) LRUs shall include devices (such as polarising keys) which prevent the insertion of the unit into incorrect locations, where incorrect insertion could lead to equipment damage or safety issues.

#### 5.2.10. Transport Cases

(DSU-NF-71) Transport cases shall offer a minimum level of protection designated by IP54 of International Electrotechnical Commission (IEC) International Standard 60529.

#### 5.2.11. Equipment Controls Protection

(DSU-NF-72) Equipment shall be located or housed in such a way that accidental actuation of controls is avoided.

### 5.3. Cabling and Connectors

#### 5.3.1. Cable Routing

(DSU-NF-73) All cables entering or leaving equipment cabinets shall:

- not hamper operations,
- not hamper handling,
- not create unsafe conditions,
- not hamper access to other cables,
- be grouped by functions.

#### 5.3.2. Cable Duct

(DSU-NF-74) There shall be sufficient cable ducts, to carry

(1) Power and Grounding Cables

(2) Copper and Fibreoptic signal and data cables, respecting separation requirements in SDIP29

#### 5.3.3. Connector Characteristics - Keying

(DSU-NF-75) All connectors provided with the equipment shall be keyed or marked to prevent interchanging of the mating connectors and improper insertion.

#### 5.3.4. Connector Characteristics - Tools

(DSU-NF-76) All external Connectors shall be capable of being disconnected and reconnected without the use of tools.

#### 5.3.5. Container/Transport Case Cable Entry Panels

(DSU-NF-77) Containers and transport cases shall have separate cable entry panels for power (including ground) cables and signal cables

### 5.4. Cable/Wiring Protection

#### 5.4.1. Cables/Wires Identification.

(DSU-NF-78) Cables and wires shall carry identification at each end.

#### 5.4.2. Cables/Wires Identification Commonality

(DSU-NF-79) Cables and wires identification numbers shall be the same as given in the drawings and in the Operation and Maintenance Manuals.

#### 5.4.3. Cables Protection from Sharp Edges

(DSU-NF-80) Wires and cables shall be so placed and protected so as to prevent contact with rough, irregular surfaces and sharp edges.

#### 5.4.4. Cable Bending Radius

(DSU-NF-81) Cable conduits shall be built in such a way that the allowable cable bending radiuses established by the cable manufacturer is always respected.

#### 5.4.5. Fibreoptic Cable Bending Radius

(DSU-NF-82) Notwithstanding the above requirement, fibreoptic cable conduits shall be built in such a way, that a cable bending radius of 8 cm is respected.

#### 5.4.6. Cables Heat Protection

(DSU-NF-83) Cable harnesses shall be routed away from heat generating equipment or exterior container surfaces.

#### 5.4.7. Cable Tension

(DSU-NF-84) No connection, wire or cable shall be in tension.

#### 5.4.8. Cable Thermal Expansion

(DSU-NF-85) Cable shall be looped sufficiently to allow for thermal expansion and retraction as well as internal equipment movement during transportation.

#### 5.4.9. Spring-Loaded Clamp connections

(DSU-NF-86) Where suitable components are available, spring-loaded clamp connections shall be used.

#### 5.4.10. Screw Connections

(DSU-NF-87) If clamp connection is not feasible, screw connections shall be preferred over soldered connections.

#### 5.4.11. Instructions for Periodic re-Tensioning

(DSU-NF-88) The contractor shall provide a document, including images, providing instructions for the periodic re-tensioning of any screw connections

#### 5.4.12. Solder Connections – Surface

(DSU-NF-89) All soldered connections shall be clean and smooth in appearance.

#### 5.4.13. Solder Connections – Heat Damage

(DSU-NF-90) The insulation of soldered wires shall not show damage from the heat of the soldering operation.

#### 5.4.14. Cable Strain Relief

(DSU-NF-91) Suspended cables and wires shall be provided with mechanical strain relief.

#### 5.4.15. Strain Relief Location

(DSU-NF-92) Mechanical strain relief devices shall be fitted where cables can be placed under strain.

#### 5.4.16. Cable Accessibility

(DSU-NF-93) Cable Management and Power Distribution Units shall be fully accessible without removal of any equipment installed in the equipment cabinets.

### 5.5. Electromagnetic Interference and Electromagnetic Radiation

All equipment should be designed and constructed to minimise its electric and magnetic field emissions, and to minimise equipment susceptibility to electric and magnetic fields. The Electromagnetic Interference (EMI) may be transferred through cables (Conducted Emission (CE) or Conducted Susceptibility (CS)) or through the ether (Radiated Emission (RE) or Radiated Susceptibility (RS)).

#### 5.5.1. Conducted Emission Levels of DI Cables

(DSU-NF-94) The CE from DI cables shall not exceed the levels specified in MIL-STD-461, Requirement CE102.

#### 5.5.2. Conducted Susceptibility Levels of DI Cables (Air Force)

(DSU-NF-95) The CS of DI cables shall be within the limits specified in MIL-STD-461, Requirements CS101, CS114, CS115 and CS116.

#### 5.5.3. Conducted Susceptibility Levels of DI Cables (Army)

(DSU-NF-96) The CS of DI cables shall be within the limits specified in MIL-STD-461 Requirements CS101, CS114, CS115 and CS116.

#### 5.5.4. Radiated Emission Levels



(DSU-NF-97) The RE shall not exceed the levels specified in MIL-STD-461, requirements RE101 (curve Army) and RE102 (curve Army).

#### 5.5.5. DI Equipment Radiated Emission Levels

(DSU-NF-98) The RE from DI equipment, including cables, shall not exceed the levels specified in MIL-STD-461, requirements RE101 (curve Army) and RE102 (curve Army).

#### 5.5.6. Radiated Susceptibility Levels – Table Ground (Air Force)

(DSU-NF-99) The RS of DI equipment, including cables shall be within the limits specified in MIL-STD-461, Requirement RS103, table Ground/Air Force.

#### 5.5.7. Radiated Susceptibility Levels - Table Ground (Army)

(DSU-NF-100) The RS of DI equipment, including cables, shall be within the limits specified in MIL-STD-461, Requirement RS103, table Ground/Army.

#### 5.5.8. European Community EMI Conformity for COTS Items – CE Marking

(DSU-NF-101) Each COTS item, including cables, shall bear the European Community (EC) CE conformity marking.

#### 5.5.9. European Community EMI Conformity for COTS Items - Declaration

(DSU-NF-102) The system shall conform to the EC Council Directive on Electromagnetic Compatibility.

#### 5.5.10. EMI Self-Compatibility

(DSU-NF-103) The operational performance of the system shall be maintained because of EMI when all components of the system are operating together.

### 5.6. Nameplates and Product Markings

Nameplates and product markings are required for identification of hardware and software items. Bar-coding is required for automated identification of hardware and software items and media containing software and documentation.

#### 5.6.1. Item Markings

(DSU-NF-104) Each equipment item, that is subject to removal, replacement or repair shall be identifiable by permanent and legible markings or labelling which provide unambiguous correlation between the item, the respective configuration documentation and other associated data.

#### 5.6.2. Bar Code

(DSU-NF-105) LRUs and their packaging shall be display a bar code in accordance with STANAG4329.

#### 5.6.3. Visibility of Item Markings

(DSU-NF-106) Identification markings of items shall be readily visible to and readable by maintenance personnel without removal of the item or adjacent items.

#### 5.6.4. Characteristics of Markings

(DSU-NF-107) Markings/labelling shall be provided which facilitate the assembly, replacement, connection, adjustment or operation of the various portions of the equipment.

#### 5.6.5. Panel Markings

(DSU-NF-108) Markings shall be provided near signal vault, power vault and other panel facilities used for connectors, controls, indicators, jacks, keys and switches, clearly indicating the use or purpose of that part.

#### 5.6.6. Marking of Sensitive Parts

(DSU-NF-109) Parts having highly sensitive characteristics and susceptibility to damage when removing them or to degradation in performance from environmental field forces shall be marked i.a.w. MIL-STD-130, Figure 3.

#### 5.6.7. Identification of Removable Cables

(DSU-NF-110) Removable cables internal and external to work positions, cabinets, frames, shelters and transport cases shall be marked i.a.w. MIL-HDBK-454, Guideline 67 Section 4.3.3 and 4.11.

#### 5.6.8. Cable Conductor Identification

(DSU-NF-111) Individual conductors within a DI cable assembly and individual cables within DI multi-cable interconnection harnesses shall be uniquely identified by means of colour coding or identification markers; identification markers being spaced not more than 0.5 m apart.

#### 5.6.9. Information Provided on Nameplate

(DSU-NF-112) Each DI shall have a nameplate that contains the NSN, the manufacturer's part number, the equipment name, a serial number (starting with 1 and continuing consecutively up to the total number of such equipment units provided) and the Configuration Management information.

#### 5.6.10. Updating of Nameplate Information

(DSU-NF-113) Nameplates of DIs shall have provision for showing configuration control information, by modification strike or similar action.

#### 5.6.11. Nameplate Attachment

(DSU-NF-114) Nameplates shall remain attached to the equipment during handling, operation, transportation and storage.

#### 5.6.12. Nameplate Labelling Standard

(DSU-NF-115) Characteristics and labelling of nameplates, markings and labels on DIs shall be i.a.w. MIL-STD-1472 Section 5.4.

#### 5.6.13. Item Labelling

(DSU-NF-116) Items and packaging shall be labelled to clearly identify the item.

#### 5.6.14. Marking of Packaging and Containers

(DSU-NF-117) Marking of packaging and containers for DIs shall be i.a.w. STANAG 4281.

### 5.7. Interchangeability

Components, assemblies and parts should be standardised to provide maximum interchangeability and economies of scale in implementation and support.

#### 5.7.1. Interchangeability

(DSU-NF-118) DIs shall be designed to be interchangeable i.a.w. MIL-HDBK-454, Guideline 7.

#### 5.7.2. Interchangeability of Items

(DSU-NF-119) All assemblies and associated parts having the same part number or same NSN shall be directly and completely interchangeable with respect to installation and performance (i.e. form, fit and function).

#### 5.7.3. Adjustments on Replacement

(DSU-NF-120) A replacement LRU that is within the full range of dimensions and characteristics allowed by the design, shall provide the full specified performance capability without adjustment, other than using operator controls.

## 6. Container Design Requirements

### 6.1. Container Design

#### 6.1.1. Container Design

(DSU-NF-121) ISO Containers shall comply with the requirements of the relevant ISO standards, including ISO 1496, ISO 668 and ISO 1161.

#### 6.1.2. International Convention for Safe Containers (CSC)

(DSU-NF-122) ISO Containers shall comply with the requirements of the International Convention for Safe Containers (CSC).

#### 6.1.3. Container Ground Clearance

(DSU-NF-123) The ISO containers shall provide a minimum clearance of 12.5mm between any part of the bottom of the container and the bottom of the ISO corner

### 6.2. Container identification, Coding and marking

#### 6.2.1. Container Nameplate

(DSU-NF-124) A nameplate giving serial number, contract number, and year of manufacture, manufacturer's name and address shall be affixed to the container.

#### 6.2.2. Container Identification Marking

(DSU-NF-125) The containers identification, coding and marking shall be in accordance with ISO standard 6346: 1995.

#### 6.2.3. Container Characteristics Marking

(DSU-NF-126) The identification marks, with their characteristics size, weight (maximum gross, net and tare masses) type, shape, layout, air/surface symbol etc. shall be displayed in accordance with clause 4, 5 and 6 of ISO 6346: 1995 Edition 3.

#### 6.2.4. Container Number

(DSU-NF-127) The three letters of the container owner's (NATO) code shall be 'NAT'.

#### 6.2.5. Customs Markings

(DSU-NF-128) The containers shall be marked in accordance with the Customs Convention on the International Transport of Goods under the cover of T.I.R. ('Transit International Routier/International Road Transport) International convention for safe containers.

### 6.3. Delamination and Voids

Delamination, as applied to this specification is defined as the condition that exists in a panel when two surfaces that are to be bonded together are no longer bonded together. Delaminations may occur between any two bonded surfaces, for example, between members and core, between core and skin or between skin and member.

Voids, as they apply to this specification are defined as any unauthorised separation or space within a panel, such as gaps created by a missing piece of core material or break in the continuity of material.

#### 6.3.1. Number of Delaminations and Voids

(DSU-NF-129) The container shall not contain more than 10 distinct individual delaminations or voids.

#### 6.3.2. Delaminations and Void Size

(DSU-NF-130) No delamination or void shall be greater than 5cm across, measured in any direction.

### 6.4. Impact Resistance

#### 6.4.1. Impact Performance

(DSU-NF-131) The impact performance shall be such that, when a 600 x 600 mm panel specimen, supported along its four edges, is subjected to the impact of a steel cylinder, weighing 31 kg, with a diameter of 80 mm and a semi-spherical end, dropped onto the centre of the specimen from a height of 760 mm, following the impact, both skins are free from rupture or fracture and the lower skin is not dented.

### 6.5. Riveting

#### 6.5.1. Rivet Looseness

(DSU-NF-132) No more than one rivet or rivnut in ten and no more than two adjacent rivets or rivnuts shall exhibit evidence of looseness parallel to the plane of the mating surfaces due to oversized holes or looseness perpendicular to the plane of the mating surfaces due to rivets or rivnuts not being tightly seated.

#### 6.5.2. Rivet Heads Mutilation

(DSU-NF-133) No more than one rivet or rivnut in ten and no more than two adjacent rivets or rivnuts shall be mutilated (cut, eccentric, distorted, etc).

#### 6.5.3. Countersunk Heads

(DSU-NF-134) No more than one rivet or rivnut in ten and no more than two adjacent rivets or rivnuts shall project above or below the mating surface more than 15% of the mating material thickness.

#### 6.5.4. Mating Surface Being Riveted - Damage

(DSU-NF-135) The mating surface shall not be marred or indented due to rivet or rivnut installation.

#### 6.5.5. Mating Surface Being Riveted - Distortion

(DSU-NF-136) There shall be no distortion of the mating materials.

#### 6.5.6. Foreign Material between Riveted Surfaces

(DSU-NF-137) There shall be no foreign material between riveted surfaces.

### 6.6. Welding

#### 6.6.1. Surfaces Welded

(DSU-NF-138) All surfaces to be welded shall be free from scale, paint, grease and other foreign materials.

#### 6.6.2. Weld Quality Defects

(DSU-NF-139) Welds shall be free from scabs, blisters, pock marks, cracks, voids, slag inclusion and other defects.

#### 6.6.3. Welded Joints

(DSU-NF-140) Welded joints shall be such that grinding of the finished weld is not necessary.

#### 6.6.4. Welded Assemblies

(DSU-NF-141) Welded assemblies shall be cleaned to remove any scale, oxidation products and excess flux.

### 6.7. Air and Water tightness

#### 6.7.1. Water Tightness

(DSU-NF-142) All joints, door, hatches, covers & removable panels shall be sealed to prevent the entrance of moisture.

#### 6.7.2. Air Tightness Performance

(DSU-NF-143) When the container is closed and pressurized to 150 Pa, the airflow to maintain this pressure shall be less than 0.8 l/sec.

#### 6.7.3. Immersion

(DSU-NF-144) The container, in Operation, Transportation and Storage configuration, when integrated with its vehicle and when separate, shall be capable of being immersed in water to a depth of 500 mm (measured from the bottom of the container), without ingress of water.

### 6.8. Roof

#### 6.8.1. Roof Load

(DSU-NF-145) The roof shall be capable of withstanding a concentrated load of 3.5 kN distributed on a 0.25m<sup>2</sup> area (0.5m x 0.5m) anywhere on the roof.

### 6.9. Floor

#### 6.9.1. Floor Load - Distributed

(DSU-NF-146) The floor shall be capable of carrying a distributed load of 5 kN/m<sup>2</sup>.

#### 6.9.2. Floor Load - Concentrated

(DSU-NF-147) The floor shall be capable of carrying a concentrated load of 10kN distributed on a 0.25 m<sup>2</sup> area (0.5m x 0.5m) anywhere on the floor.

#### 6.9.3. Wall Load

(DSU-NF-148) The Wall shall be capable of carrying a square pattern of four loads, as specified hereunder, applied anywhere along the walls:

- Each load: 1kN, applied on a 100 mm<sup>2</sup> area (10 mm x 10 mm),
- Each area: separated by 30 cm from any other area.

### 6.10. Container Performance

#### 6.10.1. Drop Test

(DSU-NF-149) The container, when separated from its vehicle and loaded with its maximum payload, is lifted 45cm (measured from the bottom of the container to the

floor) and then dropped freely onto a reinforced concrete floor, shall show no evidence of damage or permanent distortion.

#### 6.10.2. Raised Drop Test

(DSU-NF-150) The container, when separated from its vehicle and loaded with its maximum payload, has one edge placed on a 10 cm high board and the opposite edge is raised 45 cm and allowed to fall freely onto a reinforced concrete floor, shall show no evidence of damage or permanent distortion.

### 6.11. Door & Locking

#### 6.11.1. Door Opening

(DSU-NF-151) Doors shall open outward.

#### 6.11.2. Door Dimensions

(DSU-NF-152) Doors shall be sized to allow movement in/out of all equipment/spares/packaging, including the installed 19" equipment cabinets.

#### 6.11.3. Door Closing Device

(DSU-NF-153) Doors shall be provided with a mechanism which can be operated both from inside and outside the container.

#### 6.11.4. Door Close Device Handle

(DSU-NF-154) The closing mechanism handle shall be at least 250mm long.

#### 6.11.5. Door Handle Torque

(DSU-NF-155) The maximum torque to operate the door handle shall be 90 Nm.

#### 6.11.6. Door Padlock

(DSU-NF-156) Doors shall be lockable from outside by means of a padlock (supporting a shank of 12mm minimum).

#### 6.11.7. Door Keypad Entry

(DSU-NF-157) Doors shall be fitted with a keypad entry capability appropriate for the security level of the intended Shelter use.

#### 6.11.8. Keypad Entry Bypass

(DSU-NF-158) The shelters shall be provided with capability to bypass the keypad entry system in event of a failure.

#### 6.11.9. Emergency Opening of Door

(DSU-NF-159) Provision shall be made for emergency opening of the door from the inside when the outside is padlocked.

#### 6.11.10. Door Holder

(DSU-NF-160) Doors shall be equipped with a door holder which holds the door in an open position between 90° and 110°.

#### 6.11.11. Door Protection

(DSU-NF-161) A mechanism shall channel rainwater drips away from the door gasket.

### 6.12. Access to the Roof

#### 6.12.1. Roof Access

(DSU-NF-162) The container shall be equipped with steps facilitating access to the roof when dismounted and when integrated with the vehicle.

#### 6.12.2. Roof Handhold

(DSU-NF-163) A handhold shall be mounted on the roof of the container.

#### 6.12.3. Roof Safety Harness Attachment Points

(DSU-NF-164) Roof mounted facilities shall be provided for attachment of a safety harness.

### 6.13. Overpressure

#### 6.13.1. Container Overpressure

(DSU-NF-165) The container shall be capable of withstanding an external overpressure of 14kPa.

### 6.14. Drain

#### 6.14.1. Drain Hole

(DSU-NF-166) The floor shall contain a drain hole of approximately 24 mm inside diameter complete with a captive drain plug.

#### 6.14.2. Drain Hole Plug

(DSU-NF-167) The container drain and drain plug shall be flush with the floor and operable without the use of tools (screwdriver acceptable).

### 6.15. Heat Transfer Coefficient

#### 6.15.1. Container Temperature Differential

(DSU-NF-168) The overall heat transfer coefficient of the container (with the door closed and with all other openings in the panel covered by a single-walled, non-insulated cover) shall not exceed 1.7 W/°C.m<sup>2</sup>.

### 6.16. Transport by Air

#### 6.16.1. Crash Landing

(DSU-NF-169) The complete system, comprising the vehicle, equipped container and all ancillaries shall not disintegrate in such a way that loose debris, harmful gases or fluids become free in the case of crash landing. The crash landing load cases are specified in Table 5.

Direction of loading	Aircraft type transporting container		Helicopter with slung container
	Fixed Wing	Helicopter	
Forward	8.0 g	8.0 g	
Backward	1.5 g	4.5 g	
Sideward	1.5 g	4.5 g	1.0 g
Upward	2.0 g	4.5 g	
Downward	4.5 g	8.0 g	3.75 g

Table 5 Crash Landing Load Cases

### 6.17. Fork Lift Pockets

**6.17.1. Fork Lift Pockets**

(DSU-NF-170) The Container shall be fitted with Fork Lift Pockets.

**6.18. Stacking****6.18.1. Stacking**

(DSU-NF-171) The Container shall be capable of being stacked.

**6.19. Exterior****6.19.1. Roof Coating**

(DSU-NF-172) The roof shall be finished with an anti-slip coating.

**6.19.2. Exterior Floor Coating**

(DSU-NF-173) The exterior floor bottom shall be finished with a thick (rubberised or PVC) weatherproof sealing material.

**6.20. Interior****6.20.1. Interior Painting - Ceiling**

(DSU-NF-174) The ceiling shall be painted with a matt white paint.

**6.20.2. Interior Painting - Walls**

(DSU-NF-175) The walls shall be painted with a light grey paint.

**6.20.3. Plastic Inner Skins**

(DSU-NF-176) Plastic inner skins shall be white and not painted.

**6.21. Flooring****6.21.1. Floor Covering**

(DSU-NF-177) The floor shall be entirely covered with a seamless, non-porous material.

**6.21.2. Floor Covering – Slip Resistance**

(DSU-NF-178) The floor covering shall be of minimum classification 43 (Industrial Heavy) of EN ISO 10874.

**6.21.3. Floor Covering – Electrical Resistance**

(DSU-NF-179) The floor covering shall offer Horizontal Electrical Resistance  $\leq 109$  ohm as defined in EN 1081E

**6.21.4. Floor Covering - Antistatic**

(DSU-NF-180) The floor covering shall offer Static dissipative properties with a resistance to ground between  $1.0 \times 10^6$  and  $1.0 \times 10^9$  ohms defined in EN 1081E

**6.22. Data Plate****6.22.1. Data Plate – Transportation Data**

(DSU-NF-181) A data plate giving all data required for transportation, lifting and manoeuvring of the complete Deployable System shall be affixed externally.

**6.22.2. Data Plate – Dimensions Data**

(DSU-NF-182) The data plate shall include weight, dimensions and centre of gravity in 3 dimensions.



### 6.22.3. Data Plate Material

(DSU-NF-183) The data plate shall be made of engraved anodized aluminium (not plastic).

## 6.23. Ancillaries

### 6.23.1. Number of Fire Extinguishers

(DSU-NF-184) The container shall be equipped with at least two portable CO2 fire extinguishers.

### 6.23.2. Location of Fire Extinguishers

(DSU-NF-185) Provision shall be made for at least one fire extinguisher to be installed outside (exterior of the container) near the door of the container with a retaining point inside the container to hold this fire extinguisher during transportation.

### 6.23.3. First Aid Kit

(DSU-NF-186) A first-aid kit shall be provided with each container.

### 6.23.4. First Aid kit Mounting

(DSU-NF-187) The first-aid kit shall be mounted on the inside of the container door.

### 6.23.5. Container Repair Kit

(DSU-NF-188) A container repair kit shall be provided.

### 6.23.6. Container Repair Kit Contents

(DSU-NF-189) The Container repair kit shall consist of the tools and material required to perform the repair of dents and penetrations where no reinforcing members are involved and to perform the replacement of all inter-changeable items.

### 6.23.7. Container Repair Kit Mounting

(DSU-NF-190) The container repair kit shall be fixed inside or outside the container.

## 7. Electrical Requirements

### 7.1. Power Supply Requirements

Electrical requirements to be in line with European Union (EU) regulations.

The system should be designed to minimise power consumption.

#### 7.1.1. European Union (EU) regulations

(DSU-NF-191) The equipment and installation shall comply with all current EU legislation e.g. IEC 60364.

#### 7.1.2. Electro-Magnetic Compatibility

(DSU-NF-192) The system shall meet the Electromagnetic Compatibility (EMC) Legislation as defined in European Commission, including Directives 2014/30/EC and 1999/5/EC.

#### 7.1.3. Equipment Supply

(DSU-NF-193) The equipment shall operate without degradation when connected to a main power source of Alternating Current (AC) three phase, 230 / 400 V, 50 Hz.

#### 7.1.4. Power Fluctuations – Steady State Conditions

(DSU-NF-194) The system shall deliver and maintain specified performance without degradation when operating from any combination of the following Steady State power fluctuations:-

- Voltage tolerance -  $\pm 10\%$
- Voltage variation -  $\pm 5\%$  of tolerance maximum
- Frequency tolerance -  $\pm 6\%$
- Voltage wave form deviation factor - 10% maximum

#### 7.1.5. Power Fluctuations – Transient State Voltage Amplitude

(DSU-NF-195) The system shall return to operation without degradation and without false operational or output signals following a transient voltage amplitude of  $\pm 30\%$  of nominal maximum from any point within 10% of steady-state tolerance band.

#### 7.1.6. Power Fluctuations – Transient State Frequency Amplitude

(DSU-NF-196) The system shall return to operation without degradation and without false operational or output signals following a transient frequency amplitude of  $\pm 10\%$  of nominal from any point within 6% steady state tolerance band.

#### 7.1.7. Power Fluctuations – Transient State Maximum Amplitude Duration

(DSU-NF-197) The system shall be able to withstand a 500ms maximum duration of the Transient State Voltage and Frequency Amplitude conditions without false operational or output signals

#### 7.1.8. Power Fluctuations – Transient State Recovery Time

(DSU-NF-198) The system shall without human intervention recover operations within 5s of cessation of the transient condition.

#### 7.1.9. Power Fluctuations – Power Interruption

(DSU-NF-199) The system shall be able to withstand a 500ms maximum power interruption without false operational or output signals.

#### 7.1.10. Power Fluctuations – Power Outage

(DSU-NF-200) The system shall return to operation without degradation and without false operational or output signals following a power interruption of longer than 500ms.

#### 7.1.11. Peak Transient Currents

(DSU-NF-201) The peak transient current(s) of the equipment during start-up shall be not more than 6 times the nominal peak operating current with the transient current returning to not more than 110% of the normal peak operating current in not more than 8 s.

#### 7.1.12. Power Factor

(DSU-NF-202) When operating under steady state conditions, the equipment shall be designed to present a power factor of not less than 80% leading or not less than 80% lagging.

#### 7.1.13. Load Balancing between Phases

(DSU-NF-203) On power consumers using three-phase power, the phase-to-phase loading difference shall be not more than 10%.

#### 7.1.14. Single Phase Consumers

(DSU-NF-204) Single Phase consumers, Electric outlets provided in the 19" equipment cabinets, and Utility outlets shall be balanced across the phases to the maximum extent possible.

## **7.2. Power Entry and distribution**

### **7.2.1. Power Entry**

(DSU-NF-205) The Shelter shall be designed so that it can be fed through a single source providing 50Hz 400V 125A through a 3-phase 5-wire CEE plug.

### **7.2.2. Power Entry - Alternate**

(DSU-NF-206) The Shelter shall be designed so that the user shall have the option to feed the shelter from two separate 400V 63 3-phase feeds.

### **7.2.3. Power Entry - Storage**

(DSU-NF-207) For storage, it shall be possible to feed the shelter from a single 380V 3-phase 16A feed.

### **7.2.4. 400V 16A mode of operation**

(DSU-NF-208) In a single 400V 3-phase 16A feed mode of operation, only lighting, heating and utility outlets shall be powered.

### **7.2.5. Undervoltage/Overcurrent Protection**

(DSU-NF-209) The electrical system shall protect itself and all consumers from overcurrent and undervoltage.

### **7.2.6. Multipurpose Meter**

(DSU-NF-210) Main power distributions shall be fitted with a multi-purpose meter, allowing the readout of voltage (phase/phase and phase/neutral), current per phase and frequency. A digital combo instrument is acceptable.

### **7.2.7. PDU Rating**

(DSU-NF-211) Power distributions shall be rated sufficient to power all equipment listed in Appendix F.

### **7.2.8. Power Entry Panel**

(DSU-NF-212) A power Entry Panel (Vault) shall be fitted on the outside of the shelter.

### **7.2.9. Power Entry Panel – Indicator Lights**

(DSU-NF-213) Each power entry shall be fitted with indicator lights (one per phase), allowing the operator verify if the shelter is being fed with power

### **7.2.10. Power Entry Panel – Phase Direction**

(DSU-NF-214) Each power entry shall be equipped with an instrument indicating that power is supplied with the correct phase direction, and a switch to swap two phases. This requirement only applies if the contractor selects to use three-phase equipment that is phase-direction sensitive.

### **7.2.11. Power Filters**

(DSU-NF-215) PDUs inside the 19" cabinets shall be supplied through an SDIP-29 compliant power filter.

### **7.2.12. Uninterrupted Power Supply**

(DSU-NF-216) An uninterrupted power supply system (UPS) shall be installed in the shelter.

#### 7.2.13. UPS Sizing

(DSU-NF-217) The UPS shall be designed in such a way that the output current is sufficient to power all equipment in Appendix F when supply has been cut off completely.

#### 7.2.14. UPS Battery Sizing

(DSU-NF-218) UPS Batteries shall be sufficient to power all equipment for a period of at least 20 minutes.

#### 7.2.15. UPS Designing

(DSU-NF-219) The UPS shall be designed with a 30% overcapacity pertaining to maximum output and operating time, when batteries are new (according to vendor specification).

#### 7.2.16. UPS Bypass

(DSU-NF-220) There shall be an external UPS bypass switch, which allows maintenance on all components of the UPS while the equipment is still powered.

#### 7.2.17. PDU and Power Filter

(DSU-NF-221) PDUs inside the red cabinets shall be supplied through an SDIP-29 compliant power filter.

#### 7.2.18. UPS Feed

(DSU-NF-222) The UPS shall feed all electrical consumers in the shelter.

#### 7.2.19. 125 Power Cable

(DSU-NF-223) One 50m 3-phase, 5-pole, 125A IEC60309 cable shall be provided for each shelter to feed the primary power distribution.

#### 7.2.20. 63 Power Supply Cable

(DSU-NF-224) One 50m 3-phase, 5-pole, 63A IEC60309 cable shall be provided for each shelter to feed the secondary power distribution.

#### 7.2.21. 125A/63A Adapter Cable

(DSU-NF-225) An adapter cable (3-phase, 5-pole, 63A IEC60309 male to 3-phase, 5-pole, 125A IEC60309 female) shall be provided for each shelter. This cable is used to connect the primary power distribution input, when both power distributions are fed independently.

#### 7.2.22. 63A/16A Adapter Cable

(DSU-NF-226) An adapter cable (3-phase, 5-pole, 16A IEC60309 male to 3-phase, 5-pole, 63A IEC60309 female) shall be provided for each shelter to connect it to the secondary power distribution input, when the container is in storage, so that utility outlets, lights and the electric heater can be operated.

#### 7.2.23. Cabinet PDUs

(DSU-NF-227) Each 19" Cabinet shall be equipped with two main Cabinet PDUs for consumers with redundant power systems, in such a way that no single failure in the power distribution system will leave any equipment unpowered.

#### 7.2.24. PDU Outlets

(DSU-NF-228) They shall each provide 15 C13 and 4 C19 outlets.

#### 7.2.25. PDU Mounting

(DSU-NF-229) The PDUs shall be mounted in such a way that they do not disturb installation or removal of equipment.

#### 7.2.26. A/B Switching PDU

(DSU-NF-230) A third (power-switching) PDU shall be mounted inside each cabinet for use with equipment which has no redundant power system.

#### 7.2.27. A/B switching PDU redundancy

(DSU-NF-231) The power system shall be designed in such a way that a single failure in the power system outside the A/B switching PDU shall not leave any equipment unpowered.

#### 7.2.28. Current Overload Protection

(DSU-NF-232) Each cabinet, frame or other enclosure that houses LRUs with direct AC input shall be provided with current overload protection i.a.w. MIL-HDBK-454, Guideline 8.

### 7.3. Earthing

#### 7.3.1. Secure Earthing System

(DSU-NF-233) The secure earthing (grounding) system shall be i.a.w. SDIP-29 and Mil-HDBK-419A.

#### 7.3.2. Earth Connection

(DSU-NF-234) Systems shall have the means to provide earth connections for both security and safety purposes which allow for connection of the equipment to an existing earthing system at the deployment locations.

### 7.4. Earth Rods

#### 7.4.1. Earth Rods

(DSU-NF-235) Each system shall be provided with 2 Earth rods.

#### 7.4.2. Earth Rod Type

(DSU-NF-236) Earth rods shall be of the screw or straight type.

#### 7.4.3. Earth Rod Straps

(DSU-NF-237) One 50m earthing cable shall be provided for each shelter to connect the shelter to the earthing rod, or a central ground distribution plane.

### 7.5. Electrical Safety

#### 7.5.1. Protection from Electrical Potentials

(DSU-NF-238) Personnel shall be protected from accidental contact with voltages in excess of 30V with respect to ground or frame during operation of the system

#### 7.5.2. Protection from Electrical Power

(DSU-NF-239) Power distribution in cabinets and in transport cases containing more than one LRU shall be designed so that a maintenance technician can safely (see Mil-HDBK-454B) work on one LRU while the others are still powered.

#### 7.5.3. Supply Interlocks – By-passable

(DSU-NF-240) Removable covers on equipment with operating voltages between 70 V and 500 V shall have supply interlocks i.a.w. MIL-HDBK-454, Guideline 1.

#### 7.5.4. Resistance to Earth - Connection to Earth

(DSU-NF-241) The system shall operate with a resistance between the earth connection point and earth is not more than 5 Ohm.

#### 7.5.5. Resistance to Earth – Exposed Metal

(DSU-NF-242) All exposed metal parts on electrical equipment and cabinets shall be connected to the earth connection so that the resistance between the metalwork and the earth connection point is not more than 0.5 Ohm.

#### 7.5.6. ELCBs

(DSU-NF-243) ELCBs shall be provided which cause the associated Power Supply to be disconnected within 30 ms when the current in the earth connection is exceeding 30 mA.

#### 7.5.7. ELCB Separation

(DSU-NF-244) As a minimum, each cabinet PDU shall have its own ELCB. The use of ELCB/Circuit Breaker-Combination Devices is acceptable.

#### 7.5.8. Touch Protection – Wiring Cabinets

(DSU-NF-245) Wiring Cabinets shall be designed to be touch-protected to IP20 when opened.

## 8. Survivability Requirements

### 8.1. Infrared/Thermal Emissions

The following design features, which are extracted from STANAG 4319, paragraph 6, and must be applied to limit the detection of infrared/thermal emission:

#### 8.1.1. Exhaust Airflow

(DSU-NF-246) HVAC air outlets shall not direct air flows onto visible surfaces of the equipment or onto the ground (to avoid raising dust).

#### 8.1.2. Horizontal Surfaces

(DSU-NF-247) Horizontal surfaces, except for those subjected to significant internal heating, that face upward toward the sky shall have a high thermal emissivity to prevent the sky radiation level, which is normally cooler than the background, from being reflected to an observer.

#### 8.1.3. Temperature Hot Spots

(DSU-NF-248) The apparent temperature of hot spots shall be reduced by the use of such methods as, infrared surface coatings and reflectance techniques, thermal blanketing, air ducting, stand-off structures.

#### 8.1.4. Signature High Contrast Characteristics

(DSU-NF-249) In order to reduce distinctive high contrast characteristics in the infrared/thermal signature, features such as cooling air inlets adjacent to hot exhaust outlets and areas with mismatched thermal heat capacities shall be avoided.

#### 8.1.5. Thermal Signature – Large Areas.

(DSU-NF-250) Large areas of uniform apparent temperature shall be avoided. This can be achieved by using surfaces of varying thermal properties (e.g. thermal conductivity and emissivity) to form disruptive patterns.

#### 8.1.6. Anti-Infrared Paint

(DSU-NF-251) The exterior of the Deployable system container, vehicle and any items that are to be located externally to the Deployable system container shall be painted

with infra-red reflective RAL 6014 or equivalent that complies with the requirements of STANAG 2338.

## **8.2. Acoustic Noise**

### **8.2.1. Acoustic Noise**

(DSU-NF-252) For aural non-detectability, the acoustic noise level measured from any part of the system, at a distance of 7m, shall not exceed 65 dB(A) measured in accordance with International Standard ISO 1996: Description and Measurement of Environmental Noise.

## **8.3. Fire Precautions**

### **8.3.1. Fire Extinguishers**

(DSU-NF-253) The System shall be equipped with portable fire extinguishers.

### **8.3.2. Fire Extinguishers location**

(DSU-NF-254) When in the operational state, fire extinguishers shall be mounted on the system and located close to each entrance/exit of containers and accessible without the need to open doors.

## **8.4. Camouflage Nets**

### **8.4.1. Camouflage Nets**

(DSU-NF-255) The system shall be provided with anchor points and attachments to support the fitting of camouflage nets and sun screens.

## **8.5. Blackout Lighting**

### **8.5.1. Blackout Lighting**

(DSU-NF-256) The system shall be provided with Blue Colour blackout lighting that is automatically activated when a door is opened.

### **8.5.2. Blackout Lighting Activation**

(DSU-NF-257) The Blackout Lighting system shall be capable of being engaged/disabled by an operator without tools.

# **9. HVAC and CBRN Protection Requirements**

Deployable systems are expected to operate in a variety of hostile environments. These can include extremes of natural environment requiring Heating, Ventilation and Air Conditioning (HVAC) and hostile Chemical, Biological, Radiological and Nuclear (CBRN) environments requiring specific protective filtration equipment.

The deployable system will be equipped with facilities such as HVAC and Chemical and Biological (CB) Protection system suitable to protect equipment and/or manpower across the range of environmental conditions. Protection against Radiological (R) and Nuclear (N) effects is not required.

The purpose of the CB protection system is to stop biological and chemical particles, aerosols and gases entering the container

The concept is to have a special filter system at the input of the air conditioner to "clean" the fresh air entering the container and to maintain an overpressure in the container. The purpose of the CB protection system is to stop biological and chemical particles, aerosols and gases entering the shelter.

## **9.1. Heating, Ventilation and Air Conditioning (HVAC) Equipment Requirements**

The purpose of the HVAC is to provide an environment to support ongoing operations across the environmental range.

**9.1.1. Forced Air Outlets Protection**

(DSU-NF-258) Forced air intake and exhaust outlets shall be designed so that foreign objects cannot enter the equipment through the openings with exhaust air being directed away from operating personnel and other equipment.

**9.1.2. Dust Filters**

(DSU-NF-259) The inlet(s) shall be equipped with a dust filter capable of arresting dust particles of 20 microns and more.

**9.1.3. Replacement of Air Filters**

(DSU-NF-260) The system shall allow access to and replacement of air filters without affecting the system operations.

**9.1.4. Thermal Alarm**

(DSU-NF-261) If the temperature in a cabinet or any other enclosure exceeds acceptable operating limits, an audible (minimum 70dBA) and a visible alarm shall be provided.

**9.1.5. Thermal Alarm - Disable**

(DSU-NF-262) Once activated, the audible Thermal Alarm shall have the capability of being switched off.

**9.1.6. Thermal Alarm - Reactivation**

(DSU-NF-263) If the Thermal Alarm heat condition remains for more than 15 min, the switched-off audible alarm shall be re-activated.

**9.1.7. Minimum External Air Circulation**

(DSU-NF-264) The HVAC system shall facilitate partial air exchange with the outside.

**9.1.8. CO2 Concentration**

(DSU-NF-265) It shall be designed in such a way, that if the shelter is manned with a crew of up to 4 people, the concentration of CO2 inside the shelter never rises above 1000ppm.

**9.1.9. CO2 Monitoring**

(DSU-NF-266) The shelter shall be equipped with a CO2 concentration monitor, that provides an audible alarm if the CO2 concentration exceeds a pre-set, configurable value.

**9.2. CB Filter**

**9.2.1. Anti-Blast Valve**

(DSU-NF-267) The CB filter system shall include an anti-blast valve.

**9.2.2. Particle and Aerosol Filter**

(DSU-NF-268) The CB filter system shall include a particles and aerosol filter to stop radioactive dust and chemical and biological agents delivered in the form of aerosols.

**9.2.3. Charcoal Filter**

(DSU-NF-269) The CB filter system shall include a charcoal filter.

**9.2.4. Fan**



(DSU-NF-270) The CB filter system shall include a fan.

#### 9.2.5. Bypass Valve

(DSU-NF-271) The CB filter system shall include a by-pass valve.

#### 9.2.6. Overpressure Valve

(DSU-NF-272) The CB filter system shall include an overpressure valve.

#### 9.2.7. Pressure Meter

(DSU-NF-273) The CB filter system shall include a pressure meter.

#### 9.2.8. Control Panel

(DSU-NF-274) The CB filter system shall include a control panel.

### 9.3. Anti-Blast Valve

#### 9.3.1. Anti-blast Valve Mounting

(DSU-NF-275) The anti-blast valve shall be mounted at the input of the CB filter system.

#### 9.3.2. Anti-blast Valve Performance

(DSU-NF-276) The anti-blast valve shall protect the CB filter system from damage, deformation or loss of performance, against a blast pressure pulse in excess of 5000 Pa amplitude.,

### 9.4. Particle and Aerosol Filter

#### 9.4.1. Filter Performance with Aerosols

(DSU-NF-277) The particle and aerosol filter shall be capable of stopping at least 99.97% of .3 micron DOP aerosols.

#### 9.4.2. Filter Performance with Particles

(DSU-NF-278) The particle and aerosol filter shall be capable of stopping at least 99.99% of particles greater than 0.15 micron.

#### 9.4.3. Particle and Aerosol Filter Protection

(DSU-NF-279) The particle and aerosol filter shall be equipped with a protection (e.g. metallic mesh grid) to prevent damage from objects greater than 3mm diameter.

### 9.5. Active Charcoal Filter

#### 9.5.1. Filter Performance - Non-persistent Agents

(DSU-NF-280) The active charcoal filter shall be capable of filtering an airflow of 100 m3/hr while providing protection for a period of 5 days against 2 attacks per day with non-persistent neuro-toxic agents, each 1500 mg. min/m3.

#### 9.5.2. Filter Performance - Persistent or Semi-persistent Agents

(DSU-NF-281) The active charcoal filter shall be capable of filtering an airflow of 100 m3/hr while providing protection for a period of 5 days against persistent or semi-persistent agents accumulating to 10000 mg. min/m3.

#### 9.5.3. Filter Performance - Conventional Non-persistent Agent

(DSU-NF-282) The active charcoal filter shall be capable of filtering an airflow of 100 m3/hr while providing protection for a period of 5 days against one attack with a conventional non-persistent agent, 100,000 mg min/m3.

**9.6. Fan****9.6.1. Fan performance – Pressure Drop**

(DSU-NF-283) The CB filter system fan shall overcome the pressure drop in the filters.

**9.6.2. Fan performance - Overpressure**

(DSU-NF-284) The CB filter system fan shall maintain an overpressure of 20 +/- 2 mm water column Pa in the shelter in case of air conditioner failure.

**9.6.3. Fan Design**

(DSU-NF-285) The CB filter system fan shall be designed for continuous operation.

**9.7. By-pass Valve****9.7.1. By-pass Valve Operation**

(DSU-NF-286) The CB filter system by-pass valve shall allow the operator to by-pass the filters during peacetime operation of the air conditioner.

**9.8. Over-Pressure Valve****9.8.1. Over-pressure Valve Mounting**

(DSU-NF-287) The CB filter system overpressure valve shall be mounted where it is accessible from within the shelter.

**9.8.2. Over-pressure Valve Performance**

(DSU-NF-288) The CB filter system overpressure valve shall maintain an overpressure of at least 20 mm water column Pa in the shelter.

**9.9. Pressure Meter and Alarm****9.9.1. Pressure Meter Indication**

(DSU-NF-289) The CB filter system pressure meter shall permanently indicate the overpressure in the shelter.

**9.9.2. Pressure Meter Alarm**

(DSU-NF-290) In case the overpressure drops under 15 mm water column Pa, a visual and an aural alarm shall be activated.

**9.10. Installation****9.10.1. Fresh Air Inlet Protection**

(DSU-NF-291) The fresh air inlet of the CB filter system shall be protected from the ingress of water.

**9.10.2. Anti-Blast Valve Protection**

(DSU-NF-292) The input of the anti-blast valve of the CB filter system shall be protected from damage during transportation.

**9.11. Maintenance****9.11.1. Anti-blast Valve Maintenance**

(DSU-NF-293) The anti-blast valve shall be washable.

**9.11.2. Particle and Aerosol Filter Life**

(DSU-NF-294) The particles and aerosol filters shall have 3 years minimum guaranteed life (I.e. without degradation of performance) when mounted in the CB filter system and not in use (i.e. shelter not in use or filter system in by-pass operation).

#### 9.11.3. Active Charcoal Filter Life

(DSU-NF-295) The active charcoal filter shall have 2 years minimum guaranteed life (I.e. without degradation of performance) when mounted in the CB filter system and not in use (i.e. shelter not in use or filter system in by-pass operation).

#### 9.11.4. Spare Filters

(DSU-NF-296) Spare filters shall be packaged in such a way as to ensure a shelf life of minimum ten years.

### 9.12. Replacement of Contaminated Filters

#### 9.12.1. Replacement of Contaminated Filters

(DSU-NF-297) The design of the CB filter system shall be such that contaminated filters can be removed without contaminating the shelter interior.

### 9.13. Special Air Conditioner Requirements

The concept described above implies that in case of CB attack, the condenser of the air conditioner and its associated fan will be contaminated. Therefore:

#### 9.13.1. Air Conditioner Design

(DSU-NF-298) The air conditioner condenser and its fan shall be mounted in a hermetically sealed enclosure such as to avoid contamination of the other parts of the air conditioner and the container interior.

#### 9.13.2. Decontamination of Air Conditioner

(DSU-NF-299) The system shall be capable of decontamination of the air conditioner condenser, the fan, piping etc., without the need to dismantle the whole air conditioner

### 9.14. Construction

#### 9.14.1. Installation

(DSU-NF-300) The CB and HVAC shall be installed inside the ISO dimensions of ISO container based systems.

#### 9.14.2. HVAC Inlet and Outlet Position

(DSU-NF-301) The air conditioner condenser air inlet and outlet shall be positioned so as to avoid re-circulation of exhausted air.

#### 9.14.3. HVAC Condensation

(DSU-NF-302) Air conditioner condensation shall be evacuated outside the shelter.

#### 9.14.4. Cool Alley

(DSU-NF-303) The containers shall implement a cool alley, allowing the direction of fresh air to the front of the equipment racks, and drawing air from the back. A door or curtain to separate the warm and cold side is acceptable.

### 9.15. HVAC Performance

#### 9.15.1. Readiness

(DSU-NF-304) The temperature at which the system can be switched on to commence operations shall be reached within 2 hours of the air conditioning being switched on, at any environmental condition.

#### 9.15.2. Condition Maintenance

(DSU-NF-305) For any static external ambient temperature or humidity, the air conditioning shall ensure the temperature and humidity within the shelter, during any period of 30 minutes is maintained to within 5% of the value at the start of the time period.

#### 9.15.3. Environmental Range

(DSU-NF-306) The air conditioning shall maintain an environment within the following parameters:-

- Temperature: 16°C to 24 °C
- Humidity: Approximately 45% relative humidity at 21°C, remaining above 15% at other temperatures

#### 9.15.4. Control Granularity

(DSU-NF-307) The air conditioning shall provide the capability to select a desired temperature setting at a 1°C graduation.

#### 9.15.5. Air Conditioner Over Pressure

(DSU-NF-308) The air conditioning system shall maintain an overpressure of minimum 5 mm water column Pa inside the shelter.

## 10. Safety Requirements

### 10.1. General

#### 10.1.1. Safety of Electronic Equipment

(DSU-NF-309) For DIs, safety design criteria of electronic equipment shall be i.a.w. MIL-HDBK-454, Guideline 1.

#### 10.1.2. Use of hazardous materials

(DSU-NF-310) All materials used shall comply to EU Directive 2011/65/EU (ROHS 2).

#### 10.1.3. Hazard Warning Labels

(DSU-NF-311) Hazard warning labels shall be attached to equipment wherever there is potential electrical, chemical, electromagnetic radiation, heat, weight hazard or a potential hazard caused by human contact with materials, particularly when removal of covers exposes the hazard.

#### 10.1.4. Production of Toxic or Corrosive Fumes

(DSU-NF-312) Materials used under the specified environmental and service conditions or as a result of heating due to conflagration, shall not liberate:

- gases which combine with the atmosphere to form an acid or corrosive alkali,
- toxic or corrosive fumes which would be detrimental to the performance of the equipment or health of personnel,
- gases that produce an explosive atmosphere.

#### 10.1.5. Non-Combustible Materials

(DSU-NF-313) Materials in DIs, including paint finishes, shall be non-combustible under the conditions of atmosphere, pressure and temperature specified for the equipment, i.a.w. MIL-HDBK-454, Guideline 3.

#### 10.1.6. Fungus Inert Materials

(DSU-NF-314) Contractor selected materials for DIs shall be chosen from the list of fungus-inert materials (except asbestos) specified in MIL-HDBK-454, Guideline 4, Group 1.

#### 10.1.7. Fungus Nutrient Materials

(DSU-NF-315) If DIs which contain fungus nutrient materials as listed in Group II of MIL-HDBK-454, Guideline 4 are supplied by the Contractor, the materials shall pass the tests defined in MIL-HDBK-454, Guideline 4, paragraph 4.4.

#### 10.1.8. Ozone Concentration

(DSU-NF-316) In a confined space/container, the ozone generated from equipment shall not pollute the air to an extent that 0.02 mg of ozone per m3 air is exceeded

#### 10.1.9. Asbestos Materials

(DSU-NF-317) Equipment shall not contain asbestos material.

#### 10.1.10. Glass Fibre Materials

(DSU-NF-318) Glass fibre materials shall not be used as the outer surface or covering where they may cause skin irritation to operating personnel.

### 10.2. Mechanical

#### 10.2.1. Moving Part Protection

(DSU-NF-319) Any rotating or other moving part such as ventilators, blowers, drive belts etc., shall be shielded or protected to prevent accidental contact by and injury to any personnel during operation and maintenance.

#### 10.2.2. Equipment Edges Size

(DSU-NF-320) Projecting and overhanging edges of equipment items shall be kept to a minimum in accordance to ISO 1496-1.

#### 10.2.3. Equipment Edge Shape

(DSU-NF-321) Equipment edges and corners shall be rounded.

#### 10.2.4. Fire Extinguisher Markings

(DSU-NF-322) Fire extinguishers shall be marked to indicate the method of operation and applicability i.a.w. the European standards.

### 10.3. Deployment Tools

#### 10.3.1. Shovel, Sledgehammer and Pickaxe

(DSU-NF-323) One shovel, one sledgehammer and one pickaxe shall be provided with each Deployable system.

#### 10.3.2. Shovel, Sledgehammer and Pickaxe Storage

(DSU-NF-324) The shovel, sledgehammer and pickaxe shall be stowed on or in the deployable system.

## 11. Human Factors Requirements

The design of the system should make maximum use of human engineering aspects to increase the effectiveness of operators and maintenance staff. In particular, automated support should be provided to reduce the numbers of operators required and to avoid human errors.

The human engineering aspects of control and display integration should be i.a.w. the general criteria provided in MIL-STD-1472, Section 5.1.

The human engineering aspects of the hardware maintainability should be i.a.w. the criteria provided in MIL-STD-1472, Section 5.9.

#### **11.1. Audio Alarms**

(DSU-NF-325) The design of audio alarms shall be i.a.w. MIL-STD-1472, Sections 5.3.1.

#### **11.2. Controls**

(DSU-NF-326) For DIs, the design of controls shall be i.a.w. MIL-STD-1472, Section 5.1.

#### **11.3. Visual Displays**

(DSU-NF-327) The design of visual displays shall be i.a.w. MIL-STD-1472, Section 5.2 or i.a.w. equivalent national or international standards.

#### **11.4. Noise Level Prominent Tones**

(DSU-NF-328) For any 1/3 octave band frequency, the sound pressure level generated shall not differ from the arithmetic average of the two adjacent 1/3 octave bands by more than

- 15 dB for 1/3 octave band frequency from 31.5 Hz to 125 Hz,
- 8 dB for 1/3 octave band frequency from 160 Hz to 400 Hz,
- 5 dB for 1/3 octave band frequency from 500 Hz to 8000 Hz.

## Appendix C **Equipment/Cabinet Layout**

(NU) 15559 DARS\_SUP-Specifications - Appendix C -Equipment-Cabinet Layout.pdf"

## Appendix D Additional Equipment

### 1. Rack Mount Equipment

The following items are to be provided, pre-installed into the equipment cabinets as described in Appendix C. The quantities to be provided for each shelter and as spares is provided below:

Manufacturer	Item	P/N	Qty per Shelter	Qty Spare	Qty Total
To be selected by the contractor	Power Switching PDU		6	2	14
	LC Patchfield		6		12
(Sub-Item)	LC/MTP Cassettes		19		38
(Sub-Item)	LC/LC Cassettes		5		10
To be selected by the contractor	TP Patchfield		5		10
To be selected by the contractor	PTM Tray		2		4
To be selected by the contractor	Thermal Control-Box (Thermostat, Alarm)		4	1	
To be selected by the contractor	Temperature Sensor Unit		5	1	
To be selected by the contractor	Airflow Sensor Unit		5	1	
To be selected by the contractor	Environmental Monitoring Unit		2	1	

**Table 6 Cabinet-Mount Equipment**

Note: Some equipment (e.g. media converters) are provided to be wired by the user at a later date.

### 2. Container-mounted Equipment

The following items are to be provided, pre-installed into the shelter containers. The quantities to be provided for each shelter and as spares is provided below:

Item	Qty per Shelter	Qty Spare	Qty Total
Cable Grommit	3	2	8
Shovel	1		2
Sledgehammer	1		2
Pickaxe	1		2
Fire Extinguisher	2		4
First Aid Kit	1		2
Container Repair Kit	1		2



Item	Qty per Shelter	Qty Spare	Qty Total
ACU Zone Sensor (Shelter Temperature Monitoring)	1	1	

Table 7 Container-Mount Equipment

### 3. Ancillary items

The following items are to be provided separately as part of this contract:

Item	Qty Total
Cable Grommit Insert	20
Shelter Feet	8
Earthing Rods	4
Earthing Rod Strap	4
Power Cable, 3x125A	2
Power Cable, 3x63A	2
Adapter Cable, 63/125A	2
Adapter Cable, 16/63A	2

Table 8 Ancillary Items

### 4. Item Descriptions

No specific manufacturer or part number is provided for the below parts. The contractor shall select a suitable product compliant to the description below:

#### 4.1. Power Switching PDU

Quantity: 14 (Including 2 spare)

Description: A 1U cabinet-mount PDU with 6 C13 outlets and 2 power feeds.

*(DSU-FU-57) PDU Power Capability*

The PDU shall be capable of handling 10A of current.

*(DSU-FU-58) PDU Switchover*

The PDU shall draw current from the primary power feed and electronically switch to the secondary power feed in case of failure of the primary.

*(DSU-FU-59) PDU Switchover Timing*

The switchover time shall be less than 20ms.

#### 4.2. LC/MTP Patchfield

Quantity: 12

Description: A 1U Fibreoptic Patchfield, capable of holding 4 adapter cassettes described below

#### 4.3. LC/MTP Cassette

Quantity: 38

Description: A Fibreoptic connector cassette with 6xDual-PC/LC connectors in the front and 1x MTP-12 connector in the back, connected by 50ym, OM4 multimode fibre. This item is to be installed into Item 4.2

#### 4.4. LC/LC Cassette

Quantity: 10

Description: A Fibroptic connector cassette with 6xDual-PC/LC connectors in the front and 6xDual-PC/LC connector in the back, connected by 50ym, OM4 multimode fibre. This item is to be installed into Item 4.2

#### 4.5. RJ45 TP Patchfield

Quantity: 10

Description: A 1U Patchfield with 24 RJ45 connectors. LSA Terminals and mechanical cable strain relief in back.

*(DSU-FU-60) RJ45 TP Patchfield Numbering*

Connectors shall be numbered 1-24

#### 4.6. PTM Tray

Quantity: 4

Description: A 2U Rack drawer with 12x 20-wire punchdown modules for telco cable

#### 4.7. GPS/FO Converter

Quantity: 6 pairs (including 2 spare pairs)

Description: A signal converter that will convert a GPS antenna signal on a coaxial cable to an optical signal to be transported across a multimode 50ym cable.

*(DSU-FU-61) GPS/FO Pairs*

GPS/FO Converters shall work in pairs, one converting to optical, and one back to electrical, to feed the GPS timeservers. The GPS/FO Converter shall be compatible with the Mildef SSW 500 Timeserver.

#### 4.8. GPS Antenna

Quantity: 4 (including 2 spares)

Description: An external GPS antenna (MIL-SPEC) ruggedized to be mounted on the outside of the shelter. The GPS Antenna needs to be removable for transportation or stacking. The Antenna shall be compatible with the Mildef SSW 500 Timeserver.

*(DSU-FU-62) GPS Antenna Connection*

The GPS Antenna shall be supplied with a cable to connect to Co1 Connector in the data cable vault with suppressor / lighting arrestor.

#### 4.9. GPS Signal Multiplexer

Quantity: 4 (including 2 spares)

Description: A 3-way multiplexer to distribute a GPS signal from a single antenna to be fed to at least 3 separate GPS receivers with fibre converters (N-type - optical converter, consist of GOAL A & R).

#### 4.10. GPS Surge Arrestor

Quantity: 4 (including 2 spares)

Description: A surge arrester assembly to protect the GPS splitters, converters and timeservers from the dangerous voltage induced to the GPS receiver antenna from a lightning strike, electromagnetic pulse or other damaging electromagnetic wave.

#### 4.11. Cable Grommit

Quantity: 8 (including 2 spares)

Description: A compact cable entry seal for a single cable ranging from 4 to 16 mm diameter.

(DSU-FU-63) *Cable Grommit Characteristics*

The Cable Grommit is to be water-resistant to 3 bar of pressure, dust-tight (both IP67), and allow running pre-confectioned cables with connector diameters up to 26mm.

#### 4.12. Rubber Insert for Cable Grommit

Quantity: 20 (spares)

Description: Replacement rubber insert for item **Error! Reference source not found..**

#### 4.13. Environmental Monitoring Unit

Quantity: 14 (including 2 spares)

Description: Environmental monitoring unit, to monitor, as a minimum, temperature, air flow and humidity and initiate an alert across the network, if a predefined threshold is breached.

## Appendix E **Cable Plan**

(NU) 15559 DARS\_SUP-Specifications - Appendix E - Cable Plan.pdf"

# Appendix F                      **Equipment List**

(NU) 15559 DARS\_SUP-Specifications - Appendix F - Equipment List.pdf"

## Appendix G Cable Vault

The following connectors shall be installed into the data cable vault

Label	Connector Type	Local	Connects to
St1	Stratos S960 8-strand	LC2 13-16	LSSA/LSS1 Red
St2	Stratos S960 8-strand	LC2 17-20	Spare
St3	Stratos S960 8-strand	LC2 21-24	Spare
St4	Stratos S960 8-strand	LC4 19-22	National/Spare
St5	Stratos S960 8-strand	LC6 13-16	LSSA/LSS1 Black
St6	Stratos S960 8-strand	LC6 17-20	Spare
St7	Stratos S900 2-strand	LC4 23	National/Spare
St8	Stratos S900 2-strand	LC4 24	National/Spare
St9	Stratos S900 2-strand	LC6 21	TSGT/National/Spare
St10	Stratos S900 2-strand	LC6 22	TSGT/National/Spare
St11	Stratos S900 2-strand	LC6 23	TSGT/National/Spare
St12	Stratos S900 2-strand	LC6 24	TSGT/National/Spare
Co1	BNC	GPS Surge Arrestor	GPS Antenna
Sp1	Cable Grommit		Spare
Sp2	Cable Grommit		Spare
Sp3	Cable Grommit		Spare
Sp4	Blind Flange		Spare
Sp5	Blind Flange		Spare
Sp6	Blind Flange		Spare

**Table 9 Data Cable Vault**

Note: Fibreco F900 and F960 connectors may be used instead of Stratos S900 and S960 connectors.

Note: Details about the cables connecting to the cable vault connectors, and the connectors to be installed on the remote cable end can be found in Appendix E (Cable Plan)

## Appendix H Technical Documentation

The contractor shall provide the following documentation:

- As design drawings
- As build drawings
- An itemised list of the equipment purchased and delivered by the contractor

Design drawings shall be provided electronically, using file formats, that are fully editable with standard COTS or Open-Source software.

## Appendix I Verification Cross Reference Matrix

The Verification Cross Reference Index (VCRI) identifies the list of requirements of this document.

Req ID	Title	Test Method
DSU-FU-1	Shelter Production	Inspection
DSU-FU-2	Equipment Provisioning	Inspection
DSU-FU-3	Transportation	Inspection
DSU-FU-4	Equipment Installation	Inspection, Documentation Review
DSU-FU-5	Fire Alarms System	Inspection, Test
DSU-FU-6	Alarms	Inspection, Test
DSU-FU-7	Cabinet Width	Inspection
DSU-FU-8	Cabinet Height	Inspection
DSU-FU-9	Cabinet Rail	Inspection
DSU-FU-10	Cabinet Fitting	Inspection
DSU-FU-11	Cabinet Label	Inspection
DSU-FU-12	Cable Vault	Inspection
DSU-FU-13	Data Cable Installation	Inspection, Documentation Review
DSU-FU-14	Secure Cable Installation	Inspection
DSU-FU-15	Cable Ties	Inspection
DSU-FU-16	Cable Ducting	Inspection
DSU-FU-17	Cable Ducts	Inspection, Documentation Review
DSU-FU-18	Equipment Suitability	Documentation Review
DSU-FU-19	Equipment Installation	Inspection
DSU-FU-20	Blanking Panels	Inspection
DSU-FU-21	Power Distribution Installation	Inspection, Test, Documentation Review
DSU-FU-22	Power Cables	Inspection, Test
DSU-FU-23	SBK and CCAT	Inspection
DSU-FU-24	SBK and CCAT Unit	Inspection
DSU-FU-25	Shelter Connection	Test
DSU-FU-26	SBK and CCAT Integrity	Documentation Review
DSU-FU-27	SBK and CCAT Setup and Teardown	Documentation Review, Test
DSU-FU-28	SBK and CCAT Transportation	Documentation Review
DSU-FU-29	SBK and CCAT Portability	Documentation Review



Req ID	Title	Test Method
DSU-FU-30	SBK and CCAT Isolation	Inspection, Documentation Review
DSU-FU-31	SBK and CCAT Colour	Inspection
DSU-FU-32	SBK and CCAT Gas-proof	Documentation Review
DSU-FU-33	SBK and CCAT Setup Tools	Inspection
DSU-FU-34	SBK and CCAT Terrain Installation and Operation	Documentation Review
DSU-FU-35	SBK and CCAT Transport Cases/bags	Test
DSU-FU-36	SBK Interconnection	Test
DSU-FU-37	SBK Setup and Teardown	Documentation Review
DSU-FU-38	SBK Extendable Platform	Inspection, Test
DSU-FU-39	SBK and shelter alignments	Test
DSU-FU-40	SBK Length	Inspection, Documentation Review
DSU-FU-41	SBK Inter-changeability	Inspection, Documentation Review
DSU-FU-42	CCAT Entrance	Inspection, Test
DSU-FU-43	CCAT Setup and Teardown	Documentation Review, Test
DSU-FU-44	CCAT Identical	Inspection, Documentation Review
DSU-FU-45	CCAT Operation	Test
DSU-FU-46	CCAT Components	Inspection
DSU-FU-47	CCAT Penthouse Airlock	Inspection, Test
DSU-FU-48	CCAT Penthouse Size	Test
DSU-FU-49	CCAT Penthouse Space	Test
DSU-FU-50	CCAT Weather Proof Entrance	Inspection, Test
DSU-FU-51	CCAT Cover Sheet	Inspection, Test
DSU-FU-52	Airlock Chambers	Inspection
DSU-FU-53	Chamber 1 Personnel size	Test
DSU-FU-54	Chamber 1 Space	Test
DSU-FU-55	Chamber 2 Personnel Size	Test
DSU-FU-56	Chamber 2 Space	Test
DSU-FU-57	PDU Power Capability	Test, Documentation Review
DSU-FU-58	PDU Switchover	Test
DSU-FU-59	PDU Switchover Timing	Test
DSU-FU-60	RJ45 TP Patchfield Numbering	Inspection, Documentation Review
DSU-FU-61	GPS/FO Pairs	Inspection, Documentation Review
DSU-FU-62	E1 Converter Pairs	Inspection, Documentation Review

Req ID	Title	Test Method
DSU-FU-63	E1 Converter Mounting	Inspection, Documentation Review
DSU-FU-64	GPS Antenna Connection	Inspection, Documentation Review
DSU-FU-65	Cable Grommit Characteristics	Inspection, Documentation Review

Table 10 Functional Requirements

Req ID	Title	Test Method
DSU-NF-1	Climatic Zones – Operation	Documentation Review
DSU-NF-2	Climatic Zones – Transport	Documentation Review
DSU-NF-3	Climatic Zones – Storage	Documentation Review
DSU-NF-4	Climatic Zones – Maintenance	Documentation Review
DSU-NF-5	Change of Temperature	Documentation Review
DSU-NF-6	Lightning Protection	Inspection, Documentation Review
DSU-NF-7	Lightning Protection Components	Inspection, Documentation Review
DSU-NF-8	Air Pressure Range	Documentation Review
DSU-NF-9	Wind Speed Operation and Maintenance	Documentation Review
DSU-NF-10	Wind Speed Transportation and Storage	Documentation Review
DSU-NF-11	Wind Speed Survival	Documentation Review
DSU-NF-12	Wind Speed Survival Preparation	Documentation Review
DSU-NF-13	Solar Radiation	Documentation Review
DSU-NF-14	Rainfall	Documentation Review
DSU-NF-15	Salt Spray	Documentation Review
DSU-NF-16	Snow Loading Operation and Maintenance	Documentation Review
DSU-NF-17	Snow Loading Transportation and Storage	Documentation Review
DSU-NF-18	Ice Loading	Documentation Review
DSU-NF-19	Hailstones	Documentation Review
DSU-NF-20	Dust & Sand	Documentation Review
DSU-NF-21	Gradient	Documentation Review
DSU-NF-22	Environmental Conditions in Air Transport	Documentation Review
DSU-NF-23	Environmental Conditions & Mechanical Constraints in Transport	Documentation Review

Req ID	Title	Test Method
DSU-NF-24	Environmental Conditions & Mechanical Constraints in Storage	Documentation Review
DSU-NF-25	Securing of Items during Transportation	Documentation Review
DSU-NF-26	Inclination	Documentation Review
DSU-NF-27	Shock	Documentation Review
DSU-NF-28	Vibration	Documentation Review
DSU-NF-29	Acceleration	Documentation Review
DSU-NF-30	Bump	Documentation Review
DSU-NF-31	Drop and Topple	Documentation Review
DSU-NF-32	Free-Fall in Transport Cases	Test, Documentation Review
DSU-NF-33	IP Rating during Transport and Storage	Documentation Review
DSU-NF-34	IP Rating in Operation	Documentation Review
DSU-NF-35	IP Rating Internal	Documentation Review
DSU-NF-36	Salt Fog	Documentation Review
DSU-NF-37	Acid Atmosphere	Documentation Review
DSU-NF-38	Contamination by Fluids	Documentation Review
DSU-NF-39	Decontamination	Documentation Review
DSU-NF-40	Mould Growth in Operation	Documentation Review
DSU-NF-41	Mould Growth during Storage and Transport	Documentation Review
DSU-NF-42	Road Transport – Prime Mover Equipment	Test, Documentation Review
DSU-NF-43	Road Transport – Flat Bed	Documentation Review
DSU-NF-44	Rail Transport	Documentation Review
DSU-NF-45	Water Transport	Documentation Review
DSU-NF-46	ISO Corner Handling Equipment	Inspection, Documentation Review
DSU-NF-47	ISO Corner Ground Clearance	Inspection
DSU-NF-48	Shelter Deployment via ISO Container	Documentation Review
DSU-NF-49	Transport by Transport Aircraft	Documentation Review
DSU-NF-50	Helicopter Underslung Load	Documentation Review
DSU-NF-51	Shelter Roof Protection	Documentation Review
DSU-NF-52	Weight Limits for one Persons	Inspection, Documentation Review
DSU-NF-53	Weight Limits for two Persons	Inspection, Documentation Review
DSU-NF-54	Weight Limits for multiple Persons	Inspection, Documentation Review
DSU-NF-55	Tools	Inspection, Documentation Review

Req ID	Title	Test Method
DSU-NF-56	Portability Tools	Inspection, Documentation Review
DSU-NF-57	Weight Labelling	Inspection, Documentation Review
DSU-NF-58	Special Lifting Points	Inspection, Documentation Review
DSU-NF-59	Electrical Cables	Documentation Review
DSU-NF-60	Dissimilar Metal Selection	Documentation Review
DSU-NF-61	Corrosion Protection	Documentation Review
DSU-NF-62	Modularity of Equipment	Inspection, Documentation Review
DSU-NF-63	Container Accessibility	Inspection, Test, Documentation Review
DSU-NF-64	Door-open Operation	Documentation Review
DSU-NF-65	Equipment Lubrication	Documentation Review
DSU-NF-66	Rigidity – LRU Exchange	Documentation Review
DSU-NF-67	Rigidity - Doors	Documentation Review
DSU-NF-68	Cable Extenders and Retractors	Inspection, Test, Documentation Review
DSU-NF-69	Access Door Protection	Test, Documentation Review
DSU-NF-70	Protection against Incorrect Location	Inspection, Documentation Review
DSU-NF-71	Transport Cases	Documentation Review
DSU-NF-72	Equipment Controls Protection	Inspection, Test, Documentation Review
DSU-NF-73	Cable Routing	Inspection, Documentation Review
DSU-NF-74	Cable Ducts	Inspection, Documentation Review
DSU-NF-75	Connector Characteristics - Keying	Inspection, Documentation Review
DSU-NF-76	Connector Characteristics - Tools	Inspection, Test, Documentation Review
DSU-NF-77	Container/Transport Case Cable Entry Panels	Inspection, Documentation Review
DSU-NF-78	Cables/Wires Identification	Inspection, Documentation Review
DSU-NF-79	Cable/Wires Identification Commonality	Inspection, Documentation Review
DSU-NF-80	Cable Protection from Sharp Edges	Inspection
DSU-NF-81	Cable Bending Radius	Inspection
DSU-NF-82	Fibreoptic Cable Bending Radius	Inspection, Documentation Review
DSU-NF-83	Cable Heat Protection	Inspection
DSU-NF-84	Cable Tension	Inspection
DSU-NF-85	Cable Thermal Expansion	Inspection, Documentation Review

Req ID	Title	Test Method
DSU-NF-86	Spring-Loaded Clamp Connections	Inspection, Documentation Review
DSU-NF-87	Screw Connections	Inspection
DSU-NF-88	Instructions for Periodic re-Tensioning	Documentation Review
DSU-NF-89	Solder Connections – Surface	Inspection
DSU-NF-90	Solder Connections – Heat Damage	Inspection
DSU-NF-91	Cable Strain Relief	Inspection
DSU-NF-92	Strain Relief Location	Inspection
DSU-NF-93	Cable Accessibility	Inspection
DSU-NF-94	Conducted Emission Levels of DI Cables	Documentation Review
DSU-NF-95	Conducted Susceptibility Levels of DI Cables (Air Force)	Documentation Review
DSU-NF-96	Conducted Susceptibility Levels of DI Cables (Army)	Documentation Review
DSU-NF-97	Radiated Emission Levels	Documentation Review
DSU-NF-98	DI Equipment Radiated Emission Levels	Documentation Review
DSU-NF-99	Radiated Susceptibility Levels – Table Ground (Air Force)	Documentation Review
DSU-NF-100	Radiated Susceptibility Levels - Table Ground (Army)	Documentation Review
DSU-NF-101	European Community EMI Conformity for COTS Items – CE Marking	Inspection, Documentation Review
DSU-NF-102	European Community EMI Conformity for COTS Items - Declaration	Documentation Review
DSU-NF-103	EMI Self-Compatibility	Documentation Review
DSU-NF-104	Item Markings	Inspection, Documentation Review
DSU-NF-105	Bar Code	Inspection, Documentation Review
DSU-NF-106	Visibility of Markings	Inspection, Documentation Review
DSU-NF-107	Characteristics of Markings	Inspection, Documentation Review
DSU-NF-108	Panel Markings	Inspection, Documentation Review
DSU-NF-109	Marking of Sensitive Parts	Inspection, Documentation Review
DSU-NF-110	Identification of Removable Cables	Inspection
DSU-NF-111	Cable Conductor Identification	Inspection, Documentation Review
DSU-NF-112	Information provided on Nameplate	Inspection, Documentation Review
DSU-NF-113	Updating of Nameplate Information	Inspection, Documentation Review
DSU-NF-114	Nameplate Attachment	Inspection, Documentation Review

**NATO UNCLASSIFIED**

DARS Security Upgrade Shelters, Part 4, Chapter 1, Section 1

CO- 15559 – AMDC2

<b>Req ID</b>	<b>Title</b>	<b>Test Method</b>
DSU-NF-115	Nameplate Labelling Standards	Documentation Review
DSU-NF-116	Item Labelling	Inspection
DSU-NF-117	Marking of Packaging and Containers	Inspection, Documentation Review
DSU-NF-118	Interchangability	Documentation Review
DSU-NF-119	Interchangablity of Items	Documentation Review
DSU-NF-120	Adjustment on Replacement	Inspection, Documentation Review
DSU-NF-121	Container Design	Inspection, Documentation Review
DSU-NF-122	International Convention for Safe Containers (CSC)	Inspection, Documentation Review
DSU-NF-123	Container Ground Clearance	Inspection
DSU-NF-124	Container Nameplate	Inspection
DSU-NF-125	Container Identification Marking	Inspection, Documentation Review
DSU-NF-126	Container Characteristics Marking	Inspection, Documentation Review
DSU-NF-127	Container Number	Inspection
DSU-NF-128	Customs Marking	Inspection, Documentation Review
DSU-NF-129	Number of Delaminations and Voids	Inspection
DSU-NF-130	Delaminations and Voids Size	Inspection
DSU-NF-131	Impact Performance	Documentation Review
DSU-NF-132	Rivet Looseness	Inspection
DSU-NF-133	Rivet Heads Mutilation	Inspection
DSU-NF-134	Countersunk Nuts	Inspection
DSU-NF-135	Mating Surface Being Riveted - Damages	Inspection
DSU-NF-136	Mating Surface Being Riveted - Distortion	Inspection
DSU-NF-137	Foreign Material between Riveted Surfaces	Inspection
DSU-NF-138	Surfaces Welded	Inspection
DSU-NF-139	Weld Quality Defects	Inspection
DSU-NF-140	Welded Joints	Inspection
DSU-NF-141	Welded Assemblies	Inspection
DSU-NF-142	Water Tightness	Inspection, Documentation Review
DSU-NF-143	Air Tight Performance	Documentation Review
DSU-NF-144	Immersion	Documentation Review
DSU-NF-145	Roof Load	Documentation Review

Req ID	Title	Test Method
DSU-NF-146	Floor Load - Distributed	Documentation Review
DSU-NF-147	Floor Load - Concentrated	Documentation Review
DSU-NF-148	Wall Load	Documentation Review
DSU-NF-149	Drop Test	Documentation Review
DSU-NF-150	Raised Drop Test	Documentation Review
DSU-NF-151	Door Opening	Inspection
DSU-NF-152	Door Dimensions	Inspection, Documentation Review
DSU-NF-153	Door Closing Device	Inspection
DSU-NF-154	Door Close Device Handle	Inspection
DSU-NF-155	Door Handle Torque	Documentation Review
DSU-NF-156	Door Padlock	Inspection
DSU-NF-157	Door Keypad Entry	Inspection, Test, Documentation Review
DSU-NF-158	Keypad Entry Bypass	Inspection, Test
DSU-NF-159	Emergency Opening of Door	Inspection, Test
DSU-NF-160	Door Holder	Inspection, Test
DSU-NF-161	Door Protection	Inspection
DSU-NF-162	Roof Access	Inspection
DSU-NF-163	Roof Handhold	Inspection
DSU-NF-164	Roof Safety Harness Attachment Points	Inspection, Documentation Review
DSU-NF-165	Container Overpressure	Documentation Review
DSU-NF-166	Drain Hole	Inspection
DSU-NF-167	Drainhole Plug	Inspection
DSU-NF-168	Container Temperature Differential	Documentation Review
DSU-NF-169	Crash Landing	Documentation Review
DSU-NF-170	Fork Lift Pockets	Inspection
DSU-NF-171	Stacking	Documentation Review
DSU-NF-172	Roof Coating	Inspection, Documentation Review
DSU-NF-173	Exterior Floor Coating	Inspection, Documentation Review
DSU-NF-174	Interior Painting - Ceiling	Inspection
DSU-NF-175	Interior Painting – Walls	Inspection
DSU-NF-176	Plastic Inner Skins	Inspection
DSU-NF-177	Floor Covering	Inspection
DSU-NF-178	Floor Covering – Slip Resistance	Inspection, Documentation Review

Req ID	Title	Test Method
DSU-NF-179	Floor Covering – Electrical Resistance	Test, Documentation Review
DSU-NF-180	Floor Covering – Antistatic	Test, Documentation Review
DSU-NF-181	Data Plate – Transportation Data	Inspection
DSU-NF-182	Data Plate – Dimensions Data	Inspection
DSU-NF-183	Data Plate Material	Documentation Review
DSU-NF-184	Number of Fire Extinguishers	Inspection, Documentation Review
DSU-NF-185	Location of Fire Extinguishers	Inspection
DSU-NF-186	First Aid Kit	Inspection
DSU-NF-187	First Aid Kit Mounting	Inspection
DSU-NF-188	Container Repair Kit	Inspection
DSU-NF-189	Container Repair Kit Contents	Inspection
DSU-NF-190	Container Repair Kit Mounting	Inspection
DSU-NF-191	European Union (EU) regulations	Inspection, Documentation Review
DSU-NF-192	Electro-Magnetic Compatibility	Inspection, Documentation Review
DSU-NF-193	Equipment Supply	Test, Documentation Review
DSU-NF-194	Power Fluctuations – Steady State Conditions	Documentation Review
DSU-NF-195	Power Fluctuations – Transient State Voltage Amplitude	Documentation Review
DSU-NF-196	Power Fluctuations – Transient State Frequency Amplitude	Documentation Review
DSU-NF-197	Power Fluctuations – Transient State Maximum Amplitude Duration	Documentation Review
DSU-NF-198	Power Fluctuations – Transient State Recovery Time	Documentation Review
DSU-NF-199	Power Fluctuations – Power Interruptions	Test, Documentation Review
DSU-NF-200	Power Fluctuations – Power Outage	Test, Documentation Review
DSU-NF-201	Peak Transient Currents	Documentation Review
DSU-NF-202	Power Factor	Documentation Review
DSU-NF-203	Load Balancing between Phases	Test, Documentation Review
DSU-NF-204	Single Phase Consumers	Test, Documentation Review
DSU-NF-205	Power Entry	Inspection, Documentation Review
DSU-NF-206	Power Entry – Alternate	Test, Documentation Review
DSU-NF-207	Power Entry – Storage	Test
DSU-NF-208	400V 16A mode of operation	Test, Documentation Review



Req ID	Title	Test Method
DSU-NF-209	Undervoltage/Overcurrent Protection	Test, Documentation Review
DSU-NF-210	Multipurpose Meter	Inspection, Test
DSU-NF-211	PDU Rating	Documentation Review
DSU-NF-212	Power Entry Panel	Inspection, Test
DSU-NF-213	Power Entry Panel – Indicator Lights	Inspection, Test
DSU-NF-214	Power Entry Panel – Phase Direction	Inspection, Documentation Review
DSU-NF-215	Power Filter	Documentation Review
DSU-NF-216	Uninterrupted Power Supply	Test, Documentation Review
DSU-NF-217	UPS Sizing	Documentation Review
DSU-NF-218	UPS Battery Sizing	Documentation Review
DSU-NF-219	UPS Designing	Inspection, Documentation Review
DSU-NF-220	UPS Bypass	Inspection, Test
DSU-NF-221	PDU and Power Filter	Documentation Review
DSU-NF-222	UPS Feed	Inspection, Test, Documentation Review
DSU-NF-223	125 Power Cable	Inspection, Documentation Review
DSU-NF-224	63 Power Supply Cable	Inspection, Documentation Review
DSU-NF-225	125A/63A Adapter Cable	Inspection, Documentation Review
DSU-NF-226	63A/16A Adapter Cable	Inspection, Documentation Review
DSU-NF-227	Cabinet PDUs	Inspection, Documentation Review
DSU-NF-228	PDU Outlets	Inspection, Documentation Review
DSU-NF-229	PDU Mounting	Inspection, Documentation Review
DSU-NF-230	A/B switching PDU	Test, Documentation Review
DSU-NF-231	A/B switching PDU redundancy	Inspection, Test, Documentation Review
DSU-NF-232	Current Overload Protection	Documentation Review
DSU-NF-233	Secure Earthing System	Inspection, Documentation Review
DSU-NF-234	Earth Connection	Inspection, Documentation Review
DSU-NF-235	Earth Rods	Inspection
DSU-NF-236	Earth Rod Type	Inspection
DSU-NF-237	Earth Rod Straps	Inspection, Documentation Review
DSU-NF-238	Protection from Electrical Potentials	Inspection, Documentation Review
DSU-NF-239	Protection from Electrical Power	Inspection, Documentation Review
DSU-NF-240	Supply Interlocks – By-passable	Test, Documentation Review

**NATO UNCLASSIFIED**

DARS Security Upgrade Shelters, Part 4, Chapter 1, Section 1

CO- 15559 – AMDC2

Req ID	Title	Test Method
DSU-NF-241	Resistance to Earth – Connection to Earth	Test
DSU-NF-242	Resistance to Earth – Exposed Metal	Test
DSU-NF-243	ELCBs	Inspection, Documentation Review
DSU-NF-244	ELCB Separation	Inspection, Documentation Review
DSU-NF-245	Touch Protection – Wiring Cabinets	Documentation Review
DSU-NF-246	Exhaust Airflow	Inspection
DSU-NF-247	Horizontal Surfaces	Documentation Review
DSU-NF-248	Temperature Hotspots	Documentation Review
DSU-NF-249	Signature High Contrast Characteristics	Documentation Review
DSU-NF-250	Thermal Signature – Large Areas	Documentation Review
DSU-NF-251	Anti-Infrared Paint	Documentation Review
DSU-NF-252	Acoustic Noise	Test, Documentation Review
DSU-NF-253	Fire Extinguishers	Inspection
DSU-NF-254	Fire Extinguisher Locations	Inspection
DSU-NF-255	Camouflage Nets	Inspection
DSU-NF-256	Blackout Lighting	Inspection, Test
DSU-NF-257	Blackout Lighting Activation	Inspection, Test
DSU-NF-258	Forced Air Outlets Protection	Inspection
DSU-NF-259	Dust Filters	Inspection, Documentation Review
DSU-NF-260	Replacement of Air Filters	Test, Documentation Review
DSU-NF-261	Thermal Alarm	Test
DSU-NF-262	Thermal Alarm – Disable	Test
DSU-NF-263	Thermal Alarm – Reactivation	Test
DSU-NF-264	Minimum External Air Circulation	Inspection, Documentation Review
DSU-NF-265	CO2 Concentration	Documentation Review
DSU-NF-266	CO2 Monitoring	Inspection, Documentation Review
DSU-NF-267	Anti-Blast Valve	Inspection
DSU-NF-268	Particle and Aerosol Filter	Inspection, Documentation Review
DSU-NF-269	Charcoal Filter	Inspection, Documentation Review
DSU-NF-270	Fan	Inspection
DSU-NF-271	Bypass Valve	Inspection
DSU-NF-272	Overpressure Valve	Inspection
DSU-NF-273	Pressure Meter	Inspection

Req ID	Title	Test Method
DSU-NF-274	Control Panel	Inspection
DSU-NF-275	Anti-Blast Valve Mounting	Inspection
DSU-NF-276	Anti-Blast Valve Performance	Documentation Review
DSU-NF-277	Filter Performance with Aerosols	Inspection, Documentation Review
DSU-NF-278	Filter Performance with Particles	Documentation Review
DSU-NF-279	Particle and Aerosol Filter Protection	Documentation Review
DSU-NF-280	Filter Performance – Non-Persistent Agents	Documentation Review
DSU-NF-281	Filter Performance – Persistent or Semi-persistent Agents	Documentation Review
DSU-NF-282	Filter Performance – Conventional Non-persistent Agents	Documentation Review
DSU-NF-283	Fan Performance – Pressure Drop	Documentation Review
DSU-NF-284	Fan Performance – Overpressure	Documentation Review
DSU-NF-285	Fan Design	Documentation Review
DSU-NF-286	Bypass Valve Operation	Inspection, Test
DSU-NF-287	Overpressure Valve Mounting	Inspection
DSU-NF-288	Overpressure Valve Performance	Documentation Review
DSU-NF-289	Pressure Meter Indication	Test, Documentation Review
DSU-NF-290	Pressure Meter Alarm	Documentation Review
DSU-NF-291	Fresh Air Inlet Protection	Inspection, Documentation Review
DSU-NF-292	Anti-Blast Valve Protection	Inspection
DSU-NF-293	Anti-Blast Valve Maintenance	Documentation Review
DSU-NF-294	Particle and Aerosol Filter Life	Inspection, Documentation Review
DSU-NF-295	Active Charcoal Filter Life	Inspection, Documentation Review
DSU-NF-296	Spare Filters	Inspection
DSU-NF-297	Replacement of Contaminated Filters	Documentation Review
DSU-NF-298	Air Conditioner Design	Inspection, Documentation Review
DSU-NF-299	Decontamination of Air Conditioner	Documentation Review
DSU-NF-300	Installation	Documentation Review
DSU-NF-301	HVAC Inlet and Outlet Position	Inspection
DSU-NF-302	HVAC Condensation	Inspection
DSU-NF-303	Cool Alley	Test
DSU-NF-304	Readiness	Documentation Review
DSU-NF-305	Condition Maintenance	Documentation Review

Req ID	Title	Test Method
DSU-NF-306	Environmental Range	Test, Documentation Review
DSU-NF-307	Control Granularity	Test
DSU-NF-308	Air Conditioner Over Pressure	Test
DSU-NF-309	Safety of Electronic Equipment	Documentation Review
DSU-NF-310	Use of Hazardous Materials	Documentation Review
DSU-NF-311	Hazard Warning Labels	Inspection
DSU-NF-312	Production of Toxic or Corrosive Fumes	Documentation Review
DSU-NF-313	Non-Combustible Materials	Documentation Review
DSU-NF-314	Fungus Inert Materials	Documentation Review
DSU-NF-315	Fungus Nutrient Ingredients	Documentation Review
DSU-NF-316	Ozone Concentration	Documentation Review
DSU-NF-317	Asbestos Materials	Documentation Review
DSU-NF-318	Glass Fibre Materials	Documentation Review
DSU-NF-319	Moving Part Protection	Inspection, Documentation Review
DSU-NF-320	Equipment Edges Size	Inspection
DSU-NF-321	Equipment Edges Shape	Inspection
DSU-NF-322	Fire Extinguisher Markings	Inspection, Documentation Review
DSU-NF-323	Shovel, Sledgehammer and Pickaxe	Inspection
DSU-NF-324	Shovel, Sledgehammer and Pickaxe Storage	Inspection
DSU-NF-325	Audio Alarms	Test, Documentation Review
DSU-NF-326	Controls	Test, Documentation Review
DSU-NF-327	Visual Displays	Inspection, Documentation Review
DSU-NF-328	Noise Level Prominent Tones	Test

Table 11 Nonfunctional Requirements

## Appendix J List of Abbreviations

A	Ampere
AC	Alternating Current
ACC	Air Control Centre
ACCS	Air Command and Control System
ADS-B	Automatic Dependent Surveillance - Broadcast
AECTP	Allied Environmental Conditions And Test Publication
ALF	Application Layer Firewall
ARS	Combined ACC, RPC, SFP
ASDE	Air Situation Data Exchange
BART	Black Access Router
BIRT	Black Interface Router
BISW	Black Interconnectivity Switch
BIT	Built-in Self Test
CB	Chemical and Biological
CBRN	Chemical, Biological, Radiological and Nuclear
Cat	Category (Twisted Pair Cableing)
CE	Conducted Emission
CEE	Commission internationale de réglementation en vue de l'approbation de l'équipement électrique
CIS	Communication and Information Services
Cm	Centimetre
CO2	Carbondioxide
CODE	Characteristics Of Deployable Entities
COTS	Commercial Off The Shelf
CS	Conducted Susceptibility
CS	Communication Security
DACCC	Deployable Air Command and Control Centre
CSC	Convention for Safe Containers
DARS	Deployable ARS
DSU	DARS Security Upgrade
dB	Decibel
DI	Developed Item
DOP	Di-Octyl Phthalate
EC	European Community

ECP	Engineering Change Proposal
ELCB	Earth Leakage Circuit Breaker
EMI	Electromagnetic Interference
EN	European Norm
FO	Fibreoptic
FPD	Flightplan Data
GPS	Global Positioning System
HVAC	Heating, Ventilation And Air Conditioning
Hz	Hertz
iaw	In Accordance With
IEC	International Electrotechnical Commission
IETM	Interactive Electronic Technical Manual
ILS	Integrated Logistic Support
IP	Ingress Protection Rating
IP	Internet Protocol
ISO	International Standards Organisation
LC	“Lucent Connector” Fibreoptic Connector
LIU	Link Interface Unit
kg	Kilogramm
kN	Kilonewton
kPa	Kilopascal
LF	Lift Frequency
LRU	Line Replaceable Unit
LSS	Link Support Shelter
m	Metre
mg	Milligram
MIL-HDBK	Military Handbook
MIL-STD	Military Standard
Min	Minute
mm	Millimetre
MPLS	Multiprotocol Label Switching
ms	Millisecond
MTP	Multiple-Fibre Push-On/Pull-Off (Fibreoptic Connector)
NAT	The Three Letters Of The Container Owner's (NATO)
NATO	North Atlantic Treaty Organization
NCIA	NATO Communications and Information Services Agency

NC	NATO CONFIDENTIAL
NCSW	NC Switch
NGCS	NATO General Purpose Communication System
Nm	Newtonmetre
NR	NATO RESTRICTED
NS	NATO SECRET
NSN	NATO Stock Number
NU	NATO UNCLASSIFIED
Oct	Octave
Pa	Pascal
PDU	Power Distribution Unit
PGS	Power Generation System
PVC	Polyvenyl Chloride
ppm	Parts per Million
QRP	Quick Response Package
RAL	ReichsAusschuß Für Lieferbedingungen Und Gütesicherung" (State Commission For Delivery Terms And Quality Assurance)
RAP	Recognized Air Picture
RE	Radiated Emission
RFQ	Request for Quotation
RIPLIU	Red IP LIU
RIRT	Red Interface Router
RISW	Red Interconnectivity Switch
RO	Reservation-only [Equipment]
ROHS	Reduction of Hazardous Substances
RPS	Redundant Power Supply
RPC	RAP Production Centre
RS	Radiated Susceptibility
s	Second
SAE	Society Of Automotive Engineers
SDIP	SECAN Doctrine and Information Publication
SECAN	Bureau de sécurité et d'évaluation des systèmes de communication et d'information du Comité militaire (Military Committee Communication and Information Systems Security and Evaluation Agency)
SFP	Sensor Fusion Post
SOW	Statement of Work
STANAG	Standardisation Agreement

SUP	[DARS] Security Upgrade
TDP	Technical Data Package
T.I.R	Transit International Routier (International Road Transport)
TP	Twisted Pair
UPS	Uninterrupted Power Supply
UFE	Unit Furnished Equipment
VCRI	Verification Cross-Reference Index
W	Watt