


PROJECT TITLE: EA Field OGGS Pipeline

DOCUMENT TITLE: HAUV3 Subsea Garage Loading & Unloading Procedure

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ABBREVIATIONS

Abbreviation	Definition
DP	Dynamic Positioning
HAUV	Hybrid Autonomous Underwater Vehicle
HSEQ	Health, Safety, Environment & Quality
LARS	Launch And Recovery System
PPE	Personal Protective Equipment
PTW	Permit to Work

Abbreviation	Definition
SQEP	Suitably Qualified Experienced Personnel
TBT	ToolBox Talk
TRA	Task Risk Assessment
UHF	Ultra High Frequency
VHF	Very High Frequency

REFERENCE DOCUMENTS

Ref No.	Document Title	Document Number
[101]	Management of Change Procedure	HS-PR-009
[102]	Permit to Work System Isolation Requirements	HS-PR-015
[103]	Risk Identification and Management procedure	HS-PR-003
[104]	Tool Box Talk	HS-FM-001
[105]	Project HSE Plan	HS-PL-001
[106]	Project HIRA	23-0022-HSEQ-RA-???
[107]	HAUV3 Launch & Recovery Procedure	23-0022-OPS-PR-002
[108]	23-0022 EA Field & OGGS Pipeline - Operations Procedure	23-0022-OPS-PR-001
[109]	HAUV3 Pre/Post-Dive Check List	23-0022-OPS-SCL-001
[110]	Project Execution Plan	FESL-SPDC-WEP-1909/2201

1 PURPOSE AND SCOPE

1.1 PURPOSE

The purpose of this document is to define and control the Loading and Unloading of the OGGS Pipeline Subsea Garage with HAUUV3 to ensure that these operations meet all necessary contractual requirements and conform to all relevant HSEQ requirements. It should be read in conjunction with the EA Field & OGGS Pipeline Operations Procedure [106] and the HAUUV3 Launch & Recovery Procedure [107].

1.2 SCOPE

This document covers the following areas:

- Splitting the Subsea Garage using the LARS
- Splitting the Subsea Garage using a crane
- Loading the HAUUV into the Subsea Garage
- Unloading the HAUUV from the Subsea Garage
- Rebuilding the Subsea Garage using the LARS
- Rebuilding the Subsea Garage using a crane

2 ROLES & RESPONSIBILITIES

2.1 KEY RESPONSIBILITIES

Role	Responsibilities
Project/Support Manager	<ul style="list-style-type: none">• Shall be responsible for ensuring this procedure is implemented for work scopes under their jurisdiction
HAUV Manager	<ul style="list-style-type: none">• Shall be responsible for ensuring all personnel are SQEP
HSEQ Manager	<ul style="list-style-type: none">• Shall be responsible for ensuring that this procedure meets all necessary HSEQ and compliance criteria.
HAUV Supervisor	<ul style="list-style-type: none">• Shall be responsible for ensuring this procedure is adhered to by applicable personnel under their jurisdiction
HAUV Pilot Technicians	<ul style="list-style-type: none">• Shall be responsible to comply with this procedure for mobilising & demobilising equipment
Vessel Captain	<ul style="list-style-type: none">• Shall be responsible for maintaining vessel security & safety at all times• Shall be responsible for maintaining vessel position & stability during all operations.• Shall be responsible for all maintenance and certification for all vessel supplied equipment.

Table 1: Roles & Responsibilities

All employees and contractors are responsible for effectively managing risk. All office, project, technical, and operational personnel are expected to identify hazards, understand consequences of potential incidents, and respond appropriately as part of their regular duties.

3 ORGANISATION

3.1 GENERAL

The following personnel will be required to be available during the Garage loading/unloading operations:

- 1x HAUV Supervisor
- 3x HAUV Pilot Technicians
- 1x Crane Operator / LARS operator
- 1x Banksman/Controller

3.2 ONSITE ORGANOGRAM

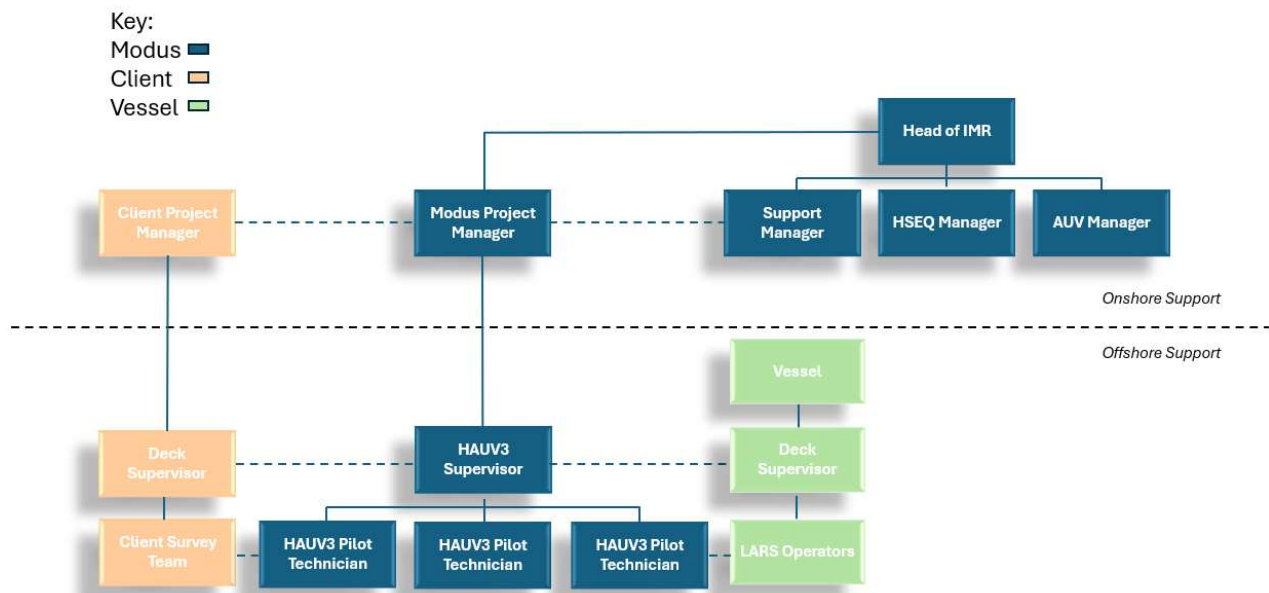


Figure 1: Onsite Organogram

3.3 COMMUNICATION

The primary form of communication between all parties and the HAUV crew will be via Clear Comms/VHF Radios. UHF radios may be utilised if required as a secondary or backup means of communication. It is especially important that the emergency channels are agreed, communicated to relevant parties, and tested prior to the commencement of operations.

For lifting operations, the primary form of communication will be via UHF radio. The secondary form of communication will be hand signals/verbal face to face.

3.4 CONTACT DETAILS

3.4.1 EMERGENCY CONTACT DETAILS

In the event of an emergency, the Duty Manager should be immediately informed so that emergency procedures may be brought into operation.

MODUS Emergency number is **+44 (0) 1325 387 478**

3.4.2 MODUS CONTACT DETAILS

Onshore, the primary MODUS project contacts will be:

Job Title	Name	Contact Details
Project Manager	Anthony Brown	Email: anthony.brown@modus-ltd.com Office: +44 (0) 1325 387 455 Mob: +44 (0) 7518125387
Support Manager	Derren Plaister	Email: derren.plaister@modus-ltd.com Office: +44 (0) 1325 387 481 Mob: +44 (0) 7570304381
HSEQ Manager	Adrew Millichap-Bell	Email: Andrew.Millichap-Bell@modus-ltd.com Office: +44 (0) 1325 387 449 Mob: tbc
Project Surveyor	Sean Quirk	Email: sean@sjqconsulting.com Mob: +44 (0) 7725322722
Project Engineer	Joe Griffiths	Email: joe.griffiths@modus-ltd.com Office: +44 (0) 1325 387 507 Mob: +44 (0) 7834 104 834

Table 2: MODUS Contacts

3.4.3 CLIENT CONTACT DETAILS

Job Title	Name	Contact Details
Client Representative	TBC	Email: tbc Mobile: TBC
Project Engineer	Bright Adieze	Email: bright.adieze@fadfae.com.ng Mobile: +31 6 1310 7532

Table 3: Client Contacts

3.4.4 THIRD PARTY CONTACT DETAILS

Job Title	Name	Contact Details
N/R		

Table 4: Third Party Contacts

4 HSEQ

All work described within this document shall be performed in accordance with requirements given in the MODUS Business Management System (BMS) which is accredited in line with ISO:9001, ISO:14001 and OSHAS:18001 Standards.

The work shall in addition be performed in accordance with the requirements given in the Contract.

All internal documents for the project relating to this subject are referenced in the table of references at the front of this document and should be read in conjunction with this procedure. Any additional task related safety awareness that needs to be highlighted will be addressed in the body of this document.

4.1 WARNINGS, CAUTIONS & NOTES

This operating procedure will be interspersed warnings, cautions and notes, these are used to direct the readers attention to specific information.

4.1.1 WARNINGS

A **WARNING** is used to alert the reader to operational or maintenance activities that may, under certain circumstances, represent a threat to safety and health. A warning precedes the paragraph or procedure which gives rise to such a threat.

4.1.2 CAUTIONS









A **CAUTION** is used to alert the reader to operational or maintenance activities which, may under certain circumstances, cause damage to equipment and/or material. A caution precedes the paragraph or procedure to which it refers.

4.1.3 NOTES

A **Note** contains information of a specific or general nature and is printed immediately after the paragraph to which it refers.

4.1.4 SYMBOLS

The following symbols may be used throughout this document:

	WARNING RISK OF PERSONAL INJURY.
	WARNING RISK OF PERSONAL INJURY DUE TO MOVING PARTS.
	WARNING TAKE PRECAUTIONS AGAINST STATIC ELECTRICITY.
	WARNING RISK OF ELECTRIC SHOCK.
	WARNING RISK OF PERSONAL INJURY DUE TO HEAVY OBJECT.
	WARNING WEAR PROTECTIVE CLOTHING AND EQUIPMENT.
	Caution Risk of damage to equipment.
	Tool Box Talk Required

4.2 RISK ASSESSMENTS

All operations will be executed in accordance with ref [103]: HS-PR-005, Risk Identification & Management Procedure.

The MODUS specific Risk Assessment should identify the risks associated with specific elements of Modus operational activities. The Risk Assessment also identifies the controls required, which also consider the different human behaviour traits that are exhibited performing the same task under different conditions. Risk Assessment shall be completed by the Team Leader/Chairman and a minimum of two experienced personnel in the activity to be assessed.

4.3 MANAGEMENT OF CHANGE

In the event of any unplanned circumstances which affect this procedure, then this procedure can be changed to ensure the safety and efficiency of the operation. Any change to this procedure will be performed in accordance with ref [101]: HS-PR-009, Management of Change Procedure and in clear understanding between the involved parties.

4.4 TOOL BOX TALKS

Tool Box Talks are required at the beginning of each shift, if the task plan changes and if new people join the team. A TBT is not limited to these times and should be given where appropriate. TBT's, ref [104]: HS-FM-001, Tool Box Talks, are identified within Procedure Task Plans.

Relevant operating procedures and associated risk assessments must be reviewed during the TBT.

4.5 PERMIT TO WORK

All operations and related work will be controlled and co-ordinated by using the PTW system where required. The implementation of the PTW is the responsibility of Modus and will ensure that all applicable works undertaken are conducted in full compliance with ref [102]: HS-PR-015, Permit to Work System Isolation Requirements.

4.6 STOPPING OPERATIONS

All team members are permitted and encouraged to stop an evolution/operation if they deem it to be unsafe, dangerous, risk of personnel injury, risk of damage to an asset or infrastructure, at no point will any blame be placed on the individual calling a stop. Two example methods of stopping an evolution/operation are explained below, however, the methods to be used during the project will be fully briefed during the onboard kick off meeting:

4.6.1 ALL STOP

This method of stopping an evolution/operation is the most urgent and is normally initiated by the way of depressing an emergency stop or calling **"ALL STOP"** over the preferred communication medium. All operations, vessel moves will be instantly stopped and the reasons investigated.

4.6.2 CONTROLLED ALL STOP

This method is to be used if the ALL STOP is not appropriate and will bring evolution/operation to a controlled and safe stop for e.g. reducing the speed of a vessel move to gradually bring the vessel to a stop, likewise with the HAUUV. This action would normally be initiated by calling for a **"CONTROLLED ALL STOP"** over the preferred communication medium.

5 PROCEDURE

The following operating procedure and task plans outline the steps to be taken to safely split, load/unload & rebuild the Subsea Garage with HAUV3.

In the event that deviation to the steps in the task plan is desired or necessary, the Management of Change procedure [101] **must** be followed.

5.1 WEATHER & SEA STATE

The ultimate decisions in regard of standby due to weather, sea state, currents and visibility shall be that of the Vessel Manager, Party Chief/Superintendent and the HAUV Supervisor jointly. In the event of disagreement however, the ultimate decision to carry out loading/unloading activities on the Garage is that of the HAUV Supervisor.

5.2 OPERATIONAL COMMUNICATIONS

The primary form of communication between all parties and the HAUV will be via Clear Comms/VHF Radios. UHF radios may be utilised if required as a secondary or backup means of communication. It is especially important that the emergency channels are agreed, communicated to relevant parties, and tested prior to the commencement of operations.


For lifting operations, the primary form of communication will be via UHF radio. The secondary form of communication will be hand signals/verbal face to face.

5.3 TETHER MANAGEMENT

Tether management is extremely important and will be continuously monitored the HAUV Supervisor and tether Winch Operator at all times. If at any time it is deemed unsafe or if there is any doubt all operations are to be brought to a controlled stop and investigated accordingly. An **ALL STOP** can be implemented at any time by anyone that observes any event or perceives any event that is unsafe.

5.4 SUBSEA GARAGE LOAD/UNLOAD TASK PLAN

Item	Task	Responsible Person
Note	The purpose of this task plan is to detail the actions to be taken to safely perform the loading & unloading of HAUV3 into the Subsea Garage.	INFO
1.	<p>Prior to any work starting, all personnel must undergo relevant safety inductions according to the site that the work is carried out on. This will include but not be limited to, the following topics:</p> <ul style="list-style-type: none"> • Explanation of the Permit to Work (PTW) System • Explanation of Tool Box Talk requirements • Explanation of Hazardous Observation Card System • PPE Requirements • Security arrangements • Lift plans, sequence of lifts and TRAs • Area barrier arrangements during lifting operations. 	HAUV Supervisor

Item	Task	Responsible Person
2. 	Undertake Toolbox talks with the relevant personnel. Command and control structure agreed. Toolbox Talks to be undertaken at the commencement of each shift or prior to complex tasks to review and update safety and operational requirements.	HAUV Supervisor
3.	Ensure that all Permits to Work and TRAs & Lift Plans and associated certificates are in place prior to commencing operations and communicated via Toolbox Talk (signed evidence required). If required, ensure PTW are renewed and put into place for the commencement of each shift.	HAUV Supervisor
4.	Ensure barriers are erected around the launch & recovery site prior to work commencing.	HAUV Supervisor
5.	Suitable handling/tag lines will be used during all lifting operations.	HAUV Supervisor
6.	All equipment is to be sea fastened at all times when not in use	HAUV Supervisor
Note	All rigging described below can be changed at the discretion of the HAUV Supervisor to suit the conditions during the recovery. Suitable rated rigging must always be used.	HAUV Supervisor

5.4.1 PRE-REQUISITES

Item	Task	Responsible Person
1.	<ul style="list-style-type: none"> HAUV buoyancy configured as per project requirements (positive/neutral/negative) ToolBox Talk complete PTW Raised and in force Barriers & Cordons in place and deck is clear of non-essential personnel Full communications check completed between all relevant parties <ul style="list-style-type: none"> HAUV Supervisor HAUV Control Survey Deck Supervisor LARS Winch operator Bridge HAUV Pre-dive checks complete [109] (as required) <p>NOTE: During operations, all comms to be limited to only the personnel directly involved in controlling the operation.</p>	HAUV Supervisor
2.	<p>Vessel to be alongside or in DP mode.</p> <p>NOTE: Vessel Master to position vessel for best stability and least movement.</p>	Bridge

5.4.2 SPLITTING THE SUBSEA GARAGE

Splitting the Subsea Garage will require the following actions

- Remove the Garage Wings
- Unbolt the legs
- Lift off the top section

5.4.2.1 WING REMOVAL

The Subsea Garage assembly has two wing sections, one port and one stbd. and each section comprises of 2 off wing fabrications which can be split into individual sections by removing the 8 off M12 nuts & bolts shown below.

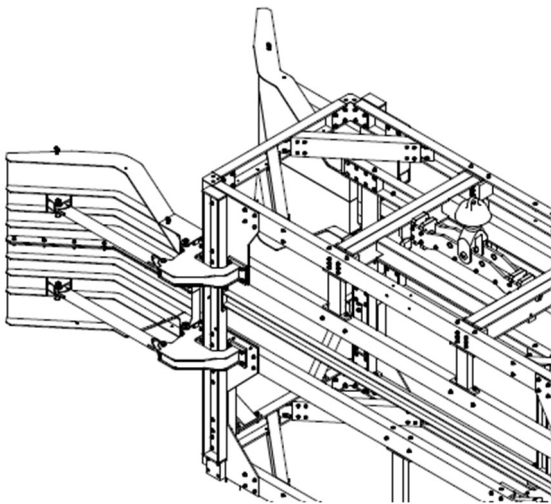


Figure 2: Wing Arrangement

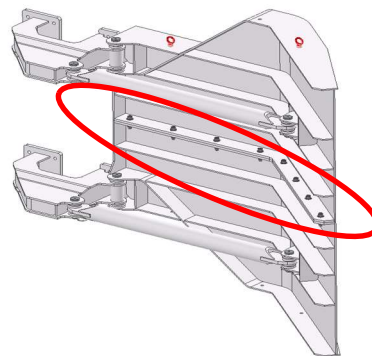

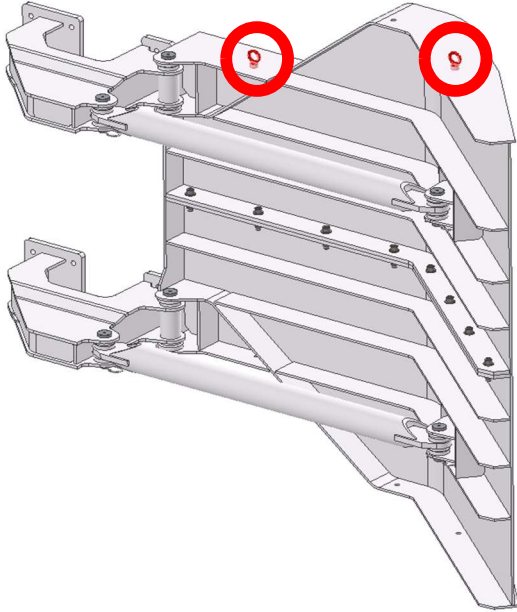
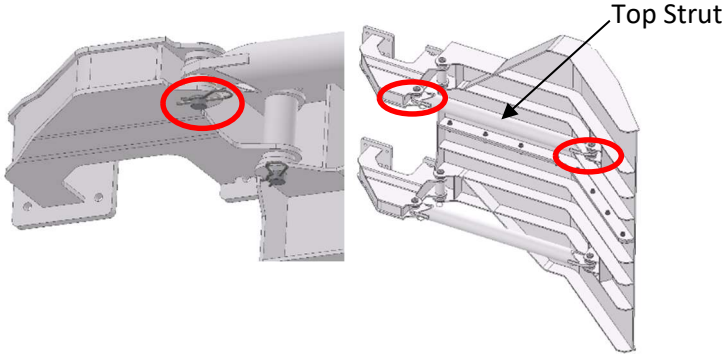
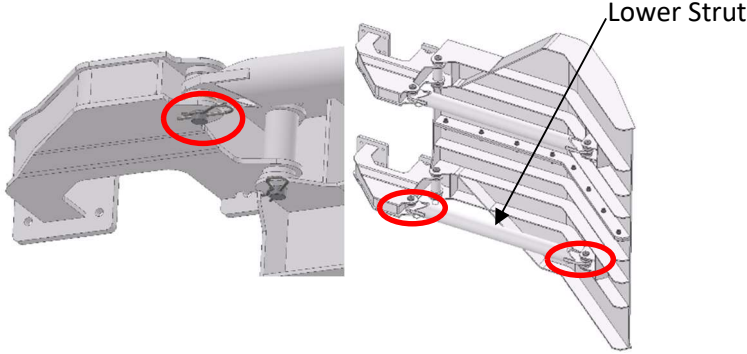
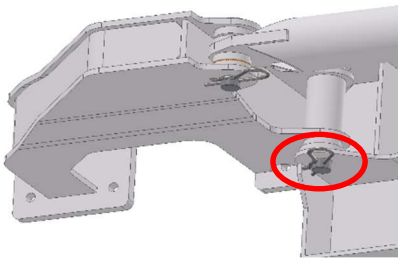
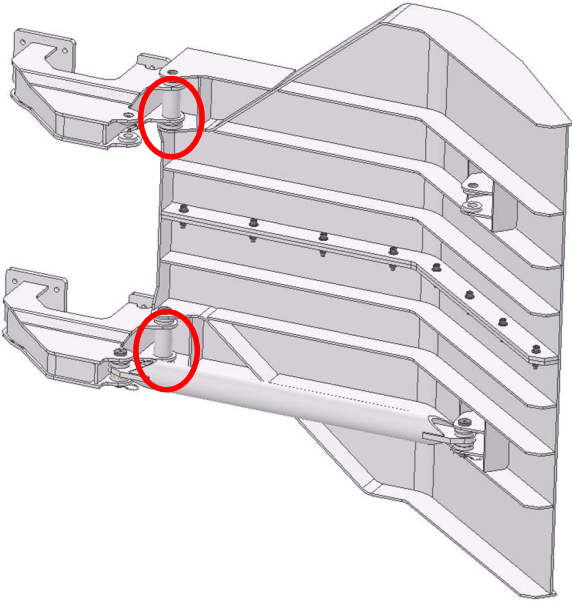
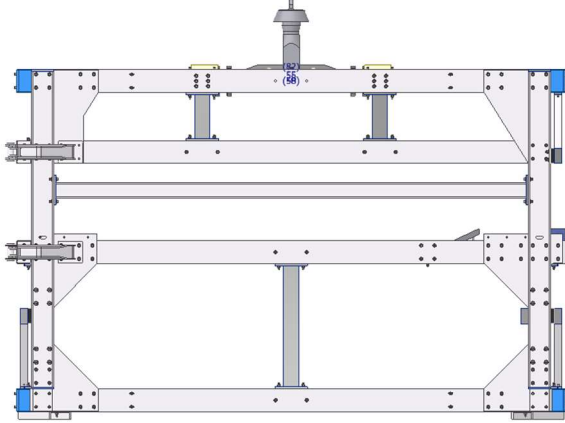


Figure 3: Wing Section Fasteners

Each individual wing fabrication weigh $\approx 28\text{kg}$ and the combined fabrications with fasteners weigh $\approx 56\text{kg}$.

Item	Task	Responsible Person
	<p>WARNING RISK OF PERSONAL INJURY DUE TO HEAVY OBJECT.</p> <p>Each wing assembly weighs ≈56kg</p>	All
1.	<p>Insert the lifting eyebolts into the port wing assembly.</p>  <p>Figure 4: Wing Lifting Eyebolts</p>	HAUV Supervisor
2.	<p>Attach a chain block and suitable lifting equipment to the wing lift points and the crane hook and take up the slack.</p>	HAUV Supervisor & Slinger
3.	<p>Remove the R-Clips and pin from the top strut</p>  <p>Figure 5: Top Strut Removal</p>	HAUV Supervisor

Item	Task	Responsible Person
4.	<p>Remove the R-Clips and pin from the lower strut.</p>  <p>Figure 6: Lower Strut Removal</p>	HAUV Supervisor
5.	<p>Remove the R-Clips from the upper and lower hinge pins</p>  <p>Figure 7: Hinge R-Clip</p>	HAUV Supervisor
6.	<p>When safe to do so remove the lower then upper hinge pins and lift the wing section clear of the garage.</p>  <p>Figure 8: Hinge Pin Removal</p>	HAUV Supervisor
7.	<p>Repeat steps 1 thru 7 for the stbd. Wing assembly</p>	HAUV Supervisor

Item	Task	Responsible Person
Info	<p>Once the wing sections have been removed the garage will resemble the below</p>  <p>Figure 9: Garage Wings Removed</p>	All
Task Complete		

5.4.2.2 GARAGE TOP SECTION REMOVAL

The top section of the garage can be removed by utilising the;

- LARS and snubber arrangement

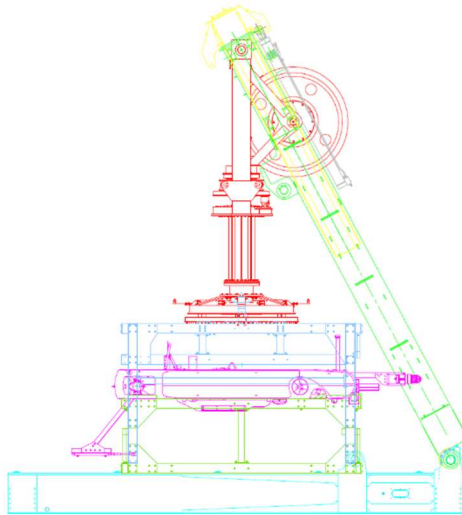


Figure 10: Top Section Removal With LARS

or

- Vessel crane with suitable lifting equipment attached to the lifting point on the bullet shown below.

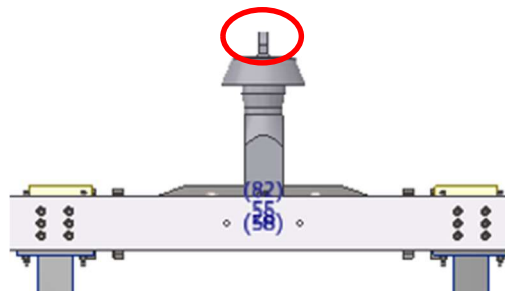

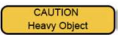
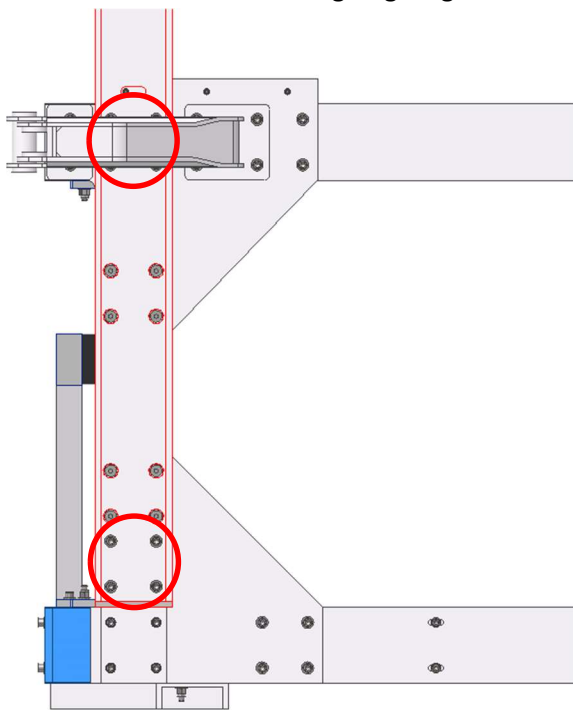


Figure 11: Bullet Lifting Point

Item	Task	Responsible Person
  CAUTION Heavy Object	WARNING RISK OF PERSONAL INJURY DUE TO HEAVY OBJECT. Caution Risk of damage to equipment	All
1.	Sea fasten garage lower section	HAUV Supervisor
2.	Attach the preferred lifting method described above to the garage. Note: If utilising the LARS the bullet is to be fully latched into the snubber before any lifting takes place	HAUV Supervisor & LARS Operator
3.	Attach handling/tag lines.	HAUV Supervisor
4.	Remove the 8 off bolts on each of the garage legs.  Figure 12: Top Section Securing Bolts Removal	HAUV Supervisor
5.	When safe to do so lift the garage top section clear and either suspend over the vessel side (LARS) or set on the deck (Crane)	HAUV Supervisor & LARS/Crane Operator
6.	Sea fasten garage top section	HAUV Supervisor
Task Complete		

5.4.3 REBUILDING THE SUBSEA GARAGE

Rebuilding the Subsea Garage will require the following actions:

- Replace the top section
- Secure the legs
- Refit the Garage Wings


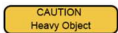

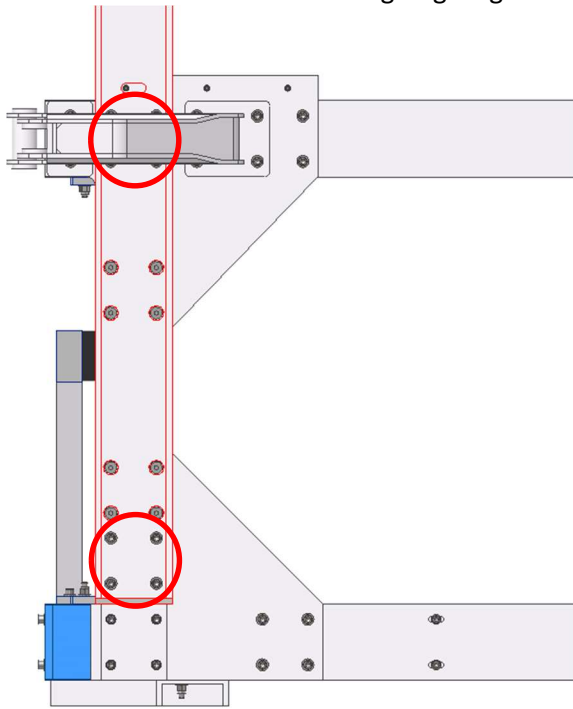
Note: All garage fasteners are to be lubricated with Aquashield or similar Anti-Gall compound and torqued i.a.w. the below values

BOLT TORQUES (Dry)	
BOLT SIZE	TORQUE [N.m]
M8	23
M10	47
M12	80


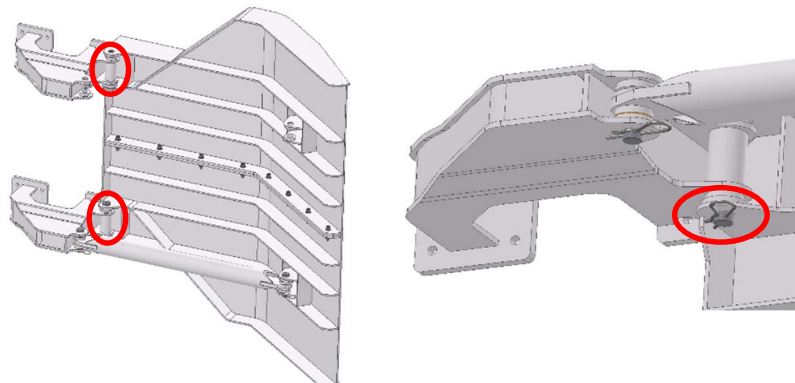
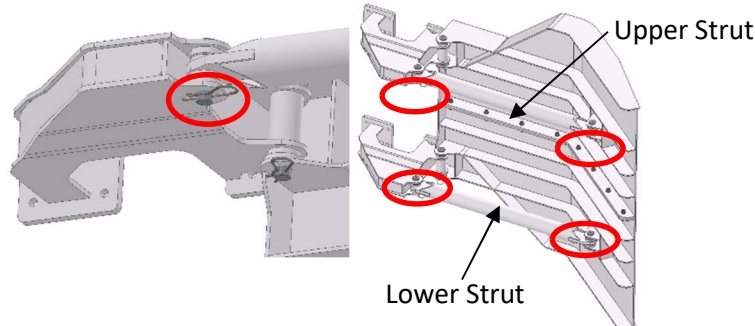
Table 5: Torque Table

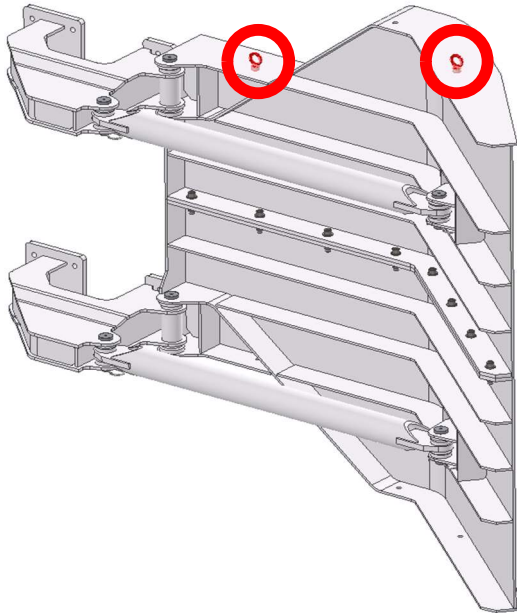
5.4.3.1 REPLACING THE TOP SECTION

The top section of the garage will be replaced utilising the same methodology for that used to separate it.

Item	Task	Responsible Person
  	WARNING RISK OF PERSONAL INJURY DUE TO HEAVY OBJECT. Caution Risk of damage to equipment	All
1.	If using the crane method reattach the lifting equipment to the garage top section	HAUV Supervisor & Crane Operator
2.	When safe to do so lift the garage top section and refit to the bottom section.	HAUV Supervisor & Crane Operator
3.	Caution Risk of damage to equipment Holes are to be fully aligned prior to refitting any bolts.	HAUV Supervisor
4.	Refit the 8 off bolts on each of the garage legs.  Figure 13: Top Section Securing Bolts Refitting Note: Refer to Table 5 for torque settings	HAUV Supervisor
Task Complete		

5.4.3.2 WING REFITTING




Item	Task	Responsible Person
	<p>WARNING RISK OF PERSONAL INJURY DUE TO HEAVY OBJECT.</p> <p>Each wing assembly weighs ≈56kg</p>	All
1.	<p>Using the crane, lift the port wing section into position and refit the hinge pins & R-Clips.</p>  <p>Figure 14: Hinge Pin Refitting</p>	HAUV Supervisor
2.	<p>Refit the upper & lower struts, pins & R-Clips.</p>  <p>Figure 15: Upper & Lower Strut Refitting</p>	HAUV Supervisor

Item	Task	Responsible Person
3.	<p>Remove the lifting equipment and eyebolts from the port wing assembly.</p>  <p>Figure 16: Wing Lifting Eyebolts</p>	HAUV Supervisor
4.	Repeat steps 1 thru 3 for the stbd. wing assembly	HAUV Supervisor
Task Complete		




5.4.4 HAUV LOADING & UNLOADING

The following task plans outline the steps required to safely load and unload the Subsea Garage with HAUV3 when the garage has been split.

5.4.4.1 HAUV LOADING

Item	Task	Responsible Person
1.	Pre-requisites completed i.a.w. 5.3.1	HAUV Supervisor
2.	Garage is to be split i.a.w. 5.4.2 prior to conducting this procedure.	HAUV Supervisor
3.	Obtain green light from the Bridge to commence the operation.	HAUV Supervisor & Bridge
4.	 WARNING RISK OF ELECTRIC SHOCK. HAUV Tether shall remain unpowered during this procedure for tether handling requirements	HAUV Supervisor
5.	Pay out on enough Tether winch to give slack for loading	HAUV Supervisor
6.	Carry out final visual survey of HAUV prior to loading	HAUV Supervisor
7.	Ensure all deck crew (HAUV and Vessel) are in position for loading	HAUV Supervisor
8.	Attach handling/tag lines to the HAUV	HAUV Supervisor
9.	Attach the crane to the HAUV emergency recovery strop.	HAUV Supervisor & Crane Operator
10.	Remove earth straps and sea fastenings from the HAUV as required	HAUV Supervisor
11.	 Caution Risk of damage to equipment. Note: Tether is to be manually controlled during loading and slack is to be managed correctly Bend radius is to be observed throughout the evolution	HAUV Supervisor / Winch Operator
12.	 Caution Risk of damage to equipment. When safe to do so lift and transfer the HAUV to the garage and lower into position. Care is to be taken not to damage any equipment paying particular attention to the FiGs and TSS 660	HAUV Supervisor
13.	Attach HAUV earthing straps	HAUV Supervisor
14.	Disconnect lifting equipment and secure the emergency recovery strop.	HAUV Supervisor
15.	Rebuild the garage as required i.a.w. 5.4.3	HAUV Supervisor
Task Complete		

5.4.4.2 HAUV UNLOADING

Item	Task	Responsible Person
1.	Pre-requisites completed i.a.w. 5.3.1	HAUV Supervisor
2.	Garage is to be split i.a.w. 5.4.2 prior to conducting this procedure.	HAUV Supervisor
3.	Obtain green light from the Bridge to commence the operation.	HAUV Supervisor & Bridge
4. 	WARNING RISK OF ELECTRIC SHOCK. HAUV Tether shall remain unpowered during this procedure for tether handling requirements	HAUV Supervisor
5.	Pay out enough tether to give slack for unloading	HAUV Supervisor
6.	Carry out final visual survey of HAUV prior to unloading	HAUV Supervisor
7.	Ensure all deck crew (HAUV and Vessel) are in position for unloading	HAUV Supervisor
8.	Attach handling/tag lines to the HAUV	HAUV Supervisor
9.	Attach the crane to the HAUV emergency recovery strop.	HAUV Supervisor & Crane Operator
10.	Remove earth straps from the HAUV as required	HAUV Supervisor
11. 	Caution Risk of damage to equipment. Note: Tether is to be manually controlled during loading and slack is to be managed correctly Bend radius is to be observed throughout the evolution	HAUV Supervisor
12. 	Caution Risk of damage to equipment. When safe to do so lift and transfer the HAUV to the work stand. Care is to be taken not to damage any equipment paying particular attention to the FiGs and TSS 660	HAUV Supervisor / Crane Operator
13.	Attach HAUV earthing straps and sea fasten.	HAUV Supervisor
14.	Disconnect the HAUV from the crane	HAUV Supervisor
15.	Rebuild the garage as required i.a.w. 5.4.3	HAUV Supervisor
Task Complete		