

**DRAFT REVISED QRs OF HEAVY LIFT ROV**

<b>Ser No</b>	<b>QRs</b>	<b>Response from the firm</b>	
1.	<p><b><u>Weight and Dimension</u></b></p> <p>(a) Weight excluding all accessories not to exceed 1000kg.</p> <p>(b) Size of ROV should permit transportation in a mini truck (Eicher "10.75 made troops carrier" or equivalent).</p>	<b>Compliant (Mention Yes or No)</b>	<b>Comments/ suggestion (in case non compliant)</b>
2.	<p><b><u>Design Parameters</u></b></p> <p><b><u>Manipulator Assy</u></b></p> <p>(a) <b><u>Turret &amp; Arm</u></b></p> <p>(i) ROV should have turret mounted four joint angle articulated hydraulic arm capable of lifting minimum weight of 150Kg.</p> <p>(ii) ROV's should have a reach of 2m vertically and horizontally.</p> <p>(iii) ROV should support minimum 300 Degrees of turret rotation.</p> <p>(iv) ROV's jaw should have high and precise manoeuvrability and should be able to manipulate delicate objects.</p> <p>(v) Minimum or preferably no vibration in the body during movement.</p> <p>(vi) ROV should preferably feature synchronized movement to pre-programmed positions.</p> <p>(vii) ROV's arm should also feature telescopic extension of the forearm upto a min distance of 30 CM.</p> <p>(viii) Proximity sensors and/ or contact warning for ROV arm/ arms and anti-collision capability between various parts of the ROV.</p> <p>(b) <b><u>Claw Assembly</u></b></p> <p>(i) It should have continuous claw rotation in both clock and anti-clock Wise directions.</p> <p>(ii) It should be provided with attachments which can fit into the claw and cut, drag, grip, lift, twist, break glass, open &amp; close objects.</p> <p>(iii) The claw must have a camera with night vision capability and LED for illumination of working area.</p> <p>(c) <b><u>Dual Arm (Optional)</u></b></p> <p>(i) 1<sup>st</sup> Arm should have a reach of 2 meters or more and should be able to lift weight of minimum 150Kg in a collapsible position and 35 KG when fully extended.</p> <p>(ii) 2<sup>nd</sup> Arm should have a reach of 1.2 meters or more should be able to lift weight of minimum 20Kg in a collapsible position and 5 KG when fully extended.</p> <p>(iii) Both arms should have minimum independent turret rotation of 300°</p> <p>(iv) Both arms should be controlled with separate controllers and operate simultaneously across complete span of movement.</p>		

**DRAFT QRs OF HEAVY LIFT ROV (Contd...)**

<b>Ser No</b>	<b>QRs</b>	<b>Response from the firm</b>	
		<b>Compliant (Mention Yes or No)</b>	<b>Compliant (Mention Yes or No)</b>
3	<b><u>Performance Characteristics</u></b>		
	(a) <b><u>Mobility</u></b>		
	(i) The ROV should be equipped with all terrain wheels with track options for climbing sidewalks, stairs, train tracks and rough terrain.		
	(ii) Should have all wheel drive with ability to skid /steer at one place.		
	(iii) Wheels of the robot must lock in position when stopped and must not roll back/forth on an inclined surface.		
	(iv) ROV should be able to negotiate up and down slope of minimum 45 degree.		
	(v) ROV should feature a topple warning system and horizontal level monitoring mechanism.		
	(vi) The ROV must feature an auto retraction system that brings the robot back incase communication is lost or disrupted.		
	(vii) Should have top speed of at least 5km/hr.		
	(b) <b><u>Battery</u></b>		
	(i) Should be capable of operating for min 4 hrs continuously with single set of rechargeable li-ion bty or better and also a spare bty set to be provided.		
	(ii) Should have operating Temp: -20°C to + 50°C for ROV		
	4.	<b><u>Camera and Optics</u></b>	
(a) Vision System must comply with min IP 65 certificate standards.			
(b) One high resolution PTZ camera (PTZ Camera fusion day and thermal technology) having PAN (0 degree-360 degree), tilt min 180 degree & min 10 x optical zoom.			
(c) 4 high resolution fixed cameras located for front, rear, claw & weapon visibility.			
(d) All cameras must have clear field of view for their respective working area in all configurations of the arms.			
(e) LED lighting for clear illumination in the front min 5 Meter area ahead.			
(f) The robot must have at least one thermal camera.			
(g) All cameras should have night vision capability.			
5.	<b><u>Employment of Equipment</u></b>		
	(a) Carry & fire Disruptors with on board remote firing feature.		
	(b) Carry & Place RTVS effectively for scanning.		
	(c) It should have Sensors for Radiation and explosive detection.		

**DRAFT QRs OF HEAVY LIFT ROV (Contd...)**

<b><u>Ser No</u></b>	<b><u>QRs</u></b>		<b>Response from the firm</b>	
			<b>Compliant (Mention Yes or No)</b>	<b>Compliant (Mention Yes or No)</b>
	(e)	It should be able to lift objects of any shape with a strong grip.		
	(f)	Claw should open min 20cm.		
	(g)	Multiple tool attachments on the claw (cut, drag, grip, lift, twist, break glass, open & close objects).		
	(h)	Additional Barrel claws attachment be provided.		
	(j)	Parallel gripper with pressure sensor.		
	(k)	Automatic rolling back optical fibre cable.		
	(l)	Universal mount for weapon (as specified by the user).		
	(m)	All joysticks/ gamepad controllers should be able to function simultaneously.		
	(n)	Should be able to drag/ pull a Mahindra Scorpio or equivalent vehicle in neutral gear on plain road.		
6.	<b><u>Payloads</u></b>			
	(a)	Should have min one recoilless water jet disruptor mounted on the vehicle, with capability to fire it from the base station.		
	(b)	It should have universal mount for wpn (as specified by the user).		
	(c)	Should have laser aiming apparatus for firing the wpn & disruptor accurately.		
7.	<b><u>Operational Control Unit (OCU)</u></b>			
	(a)	It should be a man portable OCU in a ruggedized case with IP rating 65 with bi-directional audio -video data connectivity		
	(b)	Should have sunlight readable LED display screen of min 15".		
	(c)	The OCU should feature video recording cameras and same to be saved in internal or external memory.		
	(d)	The control of the ROV should be through joysticks or Game Pad and should also have membrane keypad or optional touch screen facility for controls & functions.		
	(e)	Should have a provision to be mounted on a wheeled adjustable tripod for ease of operator.		
	(f)	Should have min One TB storage capacity for data.		
	(g)	It should have an arrangement for powering the unit either from its own rechargeable bty or from an external power supply.		
	(h)	Should be able to perform continuous operation for min 4 hrs with a single set of rechargeable bty or better and also a spare bty set to be provided.		
	(j)	It should have safety feature against accidental firing.		
	(k)	Should have AC power charger of CE standard 2015 or above with facility to extend the length of the charger for min 15 mtrs.		
	(l)	Should have facility to configure the system to control the ROV of same type.		
	(m)	Should have operating temp : -20°C to +50°C.		

**DRAFT QRs OF HEAVY LIFT ROV (Contd...)**

<b><u>Ser No</u></b>	<b><u>QRs</u></b>	<b>Response from the firm</b>	
		<b>Compliant (Mention Yes or No)</b>	<b>Compliant (Mention Yes or No)</b>
8.	<b><u>Comn</u></b>		
(a)	Bi-directional wireless and wired data communication between the Control Station and ROV both having operation range of min 1KM & 300M respectively.		
(b)	ROV should have wireless operational range of >1km line-of-sight and >300m in Urban (NLOS) environment for communicating and controlling ROV from operators console.		
(c)	ROV should have a portable antenna to relay the wireless transmission in case line of sight is not available.		
(d)	It should have two way Intercom/ broad cast system between ROV & OCU using headset & microphone with ROV having a sensitive microphone to pickup acoustic signature, both at base station & target area.		
9.	<b><u>Firing System</u></b>		
(a)	Wireless contact electrical terminals for disruptor firing.		
(b)	Secured trigger system.		
10.	<b><u>Service and Support</u></b>		
(a)	The equipment should be provided with the following :-		
(i)	Special Maintenance Tools.		
(ii)	Cleaning Kit.		
(iii)	Documents enlisting all tech specification and capabilities.		
(iv)	Illustrated spare parts list.		
(b)	Technical specifications including inspection criteria.		
(c)	User Handbook in English		
(d)	Specifications for Packing/handling/transportation/storage.		
11.	Ruggedised and waterproof containers for ROV and Control Station.		

**DRAFT TRIAL DIRECTIVES FOR HEAVY LIFT ROV**

<b>Ser No</b>	<b>QRs</b>	<b>TDs</b>	<b>Response from the firm</b>	
			<b>Compliant (Mention Yes or No)</b>	<b>Compliant (Mention Yes or No)</b>
1.	<b><u>Weight and Dimension</u></b>			
	(a) Weight excluding all accessories not to exceed 1000kg.	BOO to physically check the weight on a weighing scale.		
	(b) Size of ROV should permit transportation in a mini truck (Eicher "10.75 made troops carrier" or equivalent).	To be physically checked by BOO.		
2.	<b><u>Design Parameters</u></b>			
	<b><u>Manipulator Assy</u></b>			
	(a) <b><u>Turret &amp; Arm</u></b>			
	(i) ROV should have turret mounted four joint angle articulated hydraulic arm capable of lifting minimum weight of 150Kg.	To be physically checked by BOO.		
	(ii) ROV's should have a reach of 2m vertically and horizontally.	To be physically checked by BOO.		
	(iii) ROV should support minimum 300 Degrees of turret rotation.	To be physically checked by BOO.		
	(iv) ROV's jaw should have high and precise maneuverability and should be able to manipulate delicate objects.	To be physically checked by BOO.		
	(v) Minimum or preferably no vibration in the body during movement.	To be physically checked by BOO.		
	(vi) ROV should preferably feature synchronized movement to pre-programmed positions.	To be physically checked by BOO.		
	(vii) ROV's arm should also feature telescopic extension of the forearm upto a min distance of 30 CM.	To be physically checked by BOO.		
	(viii) Proximity sensors and/ or contact warning for ROV arm/ arms and anti collision capability between various parts of the ROV.	To be physically checked by BOO.		

DRAFT TDs OF HEAVY LIFT ROV (Contd...)

<u>Ser No</u>	<u>QRs</u>	<u>TDs</u>	<u>Response from the firm</u>	
			<u>Compliant (Mention Yes or No)</u>	<u>Compliant (Mention Yes or No)</u>
	(b) <b><u>Claw Assembly</u></b>			
	(i) It should have continuous claw rotation in both clock and anti clock wise directions.	To be physically checked by BOO.		
	(ii) It should be provided with attachments which can fit into the claw and cut, drag, grip, lift, twist, break glass, open & close objects	To be physically checked by BOO.		
	(iii) The claw must have a camera with night vision capability and LED for illumination of working area.	To be physically checked by BOO.		
	(c) <b><u>Dual Arm (Optional)</u></b>			
	(i) 1 <sup>st</sup> Arm should have a reach of 2 meters or more and should be able to lift weight of minimum 150Kg in a collapsible position and 35 KG when fully extended.	To be physically checked by BOO.		
	(ii) 2 <sup>nd</sup> Arm should have a reach of 1.2 meters or more should be able to lift weight of minimum 20Kg in a collapsible position and 5 KG when fully extended.	To be physically checked by BOO.		
	(iii) Both arms should have minimum independent turret rotation of 300°	To be physically checked by BOO.		
	(iv) Both arms should be controlled with separate controllers and operate simultaneously across complete span of movement.	To be physically checked by BOO.		

DRAFT TDs OF HEAVY LIFT ROV (Contd...)

<u>Ser</u>	<u>QRs</u>	<u>TDs</u>	<u>Response from the firm</u>	
3.	<b><u>Performance Characteristics</u></b>		<b>Compliant (Mention Yes or No)</b>	<b>Compliant (Mention Yes or No)</b>
	(a) <b><u>Mobility</u></b>			
	(i) The ROV should be equipped with all terrain wheels with track options for climbing sidewalks, stairs, train tracks and rough terrain. It should have fording capability through minimum 30 cm deep water.	BOO to physically check the ROV under various outdoor conditions :- (a) Sidewalk. (b) Road bumps. (c) Grass, Sand and Marshy surface. (d) Train tracks. (e) Stairs. (f) Uphill Slope with rough terrain.		
	(ii) Should have all wheel drive fitted with all terrain wheels with ability to skid /steer at one place.	To be physically checked by BOO.		
	(iii) Wheels of the robot must lock in position when stopped and must not roll back/ forth on an inclined surface.	To be physically checked by BOO.		
	(iv) ROV should be able to negotiate up and down slope of minimum 45 degree.	To be physically checked by BOO.		
	(v) ROV should feature a topple warning system and horizontal level monitoring mechanism.	To be physically checked by BOO.		
	(vi) The ROV must feature an auto retraction system that brings the robot back in case communication is lost or disrupted.	To be physically checked by BOO.		
	(vii) Should have top speed of at least 5 km/hr.	To be physically checked by BOO.		

DRAFT TDs OF HEAVY LIFT ROV (Contd...)

<u>Ser No</u>	<u>QRs</u>	<u>TDs</u>	<u>Response from the firm</u>	
	(b) <b><u>Battery</u></b>		<b>Compliant (Mention Yes or No)</b>	<b>Compliant (Mention Yes or No)</b>
	(i) Should be capable of operating for min 4 hrs continuously with single set of rechargeable bty or better and also a spare bty set to be provided.	To be physically checked by BOO.		
	(ii) Should have operating Temp: -20°C to + 50°C for ROV.	National/ international accredited lab certificate to be provided by vendor.		
4.	<b><u>Camera and Optics</u></b>			
	(a) Vision System must comply with min IP 65 certificate standards.	National/International lab certification to be furnished.		
	(b) One high resolution PTZ camera (PTZ Camera fusion day and thermal technology) having PAN (0 degree-360 degree), tilt min 180 degree & min 10 x optical zoom.	To be physically checked by BOO.		
	(c) 4 high resolution fixed cameras located for front, rear, claw & weapon visibility.	To be physically checked by BOO.		
	(d) All cameras must have clear field of view for their respective working areas in all configurations of the arms.	To be physically checked by BOO.		
	(e) LED lighting for clear illumination in the front min 5 Meter area ahead.	To be physically checked by BOO.		
	(f) The robot must have at least one thermal camera.	To be physically checked by BOO.		
	(g) All cameras should have night vision capability.	To be physically checked by BOO.		
5.	<b><u>Employment of Equipment</u></b>			
	(a) Carry & fire Disruptors with on board remote firing feature.	To be physically checked by BOO.		
	(b) Carry & Place RTVS effectively for scanning.	To be physically checked by BOO.		
	(c) It should have Sensors for Radiation and explosive detection.	To be physically checked by BOO.		



DRAFT TDs OF HEAVY LIFT ROV (Contd...)

<u>Ser No</u>	<u>QRs</u>		<u>TDs</u>	<u>Response from the firm</u>	
				<u>Compliant (Mention Yes or No)</u>	<u>Compliant (Mention Yes or No)</u>
	(e)	It should be able to lift objects of any shape with a strong grip.	To be physically checked by BOO.		
	(f)	Claw should open min 20cm.	To be physically checked by BOO.		
	(g)	Multiple tool attachments on the claw (cut, drag, grip, lift, twist, break glass, open & close objects)	To be physically checked by BOO.		
	(h)	Additional Barrel claws attachment be provided.	To be physically checked by BOO.		
	(j)	Parallel gripper with pressure sensor.	To be physically checked by BOO.		
	(k)	Automatic rolling back optical fibre cable.	To be physically checked by BOO.		
	(l)	Universal mount for weapon (as specified by the user).	To be physically checked by BOO.		
	(m)	All joysticks/ gamepad controllers should be able to function simultaneously.	To be physically checked by BOO.		
	(n)	Should be able to drag/ pull a Mahindra Scorpio or equivalent vehicle in neutral gear on plain road.	To be physically checked by BOO.		
6.	<b><u>Payloads</u></b>				
	(a)	Should have min one recoilless water jet disruptor mounted on the vehicle, with capability to fire it from the base station.	To be physically checked by BOO.		
	(b)	It should have universal mount for weapon (as specified by the user).	To be physically checked by BOO.		
	(c)	Should have laser aiming apparatus for firing the weapon & disruptor accurately.	To be physically checked by BOO.		
7.	<b><u>Operational Control Unit</u></b>				
	(a)	It should be a man portable OCU in a ruggedized case with IP rating 65 with bi-directional audio -video data connectivity system with ROV.	National/International lab certification to be furnished.		
	(b)	Should have sunlight readable LED display screen of min 15".	To be physically checked by BOO.		
	(c)	The OCU should feature video recording cameras and same to be saved in internal or external memory.	To be physically checked by BOO.		

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<b>Ser No</b>	<b>QRs</b>	<b>TDs</b>	<b>Response from the firm</b>	
			<b>Compliant (Mention Yes or No)</b>	<b>Compliant (Mention Yes or No)</b>
	(d) The control of the ROV should be through joysticks or Game Pad and should also have membrane keypad or optional touch screen facility for controls & functions.	To be physically checked by BOO.	Compliant (Mention Yes or No)	Compliant (Mention Yes or No)
	(e) Should have a provision to be mounted on a wheeled adjustable tripod for ease of operator.	To be physically checked by BOO.		
	(f) Should have min One TB storage capacity for data.	To be physically checked by BOO.		
	(g) It should have an arrangement for powering the unit either from its own rechargeable bty or from an external power supply.	To be physically checked by BOO.		
	(h) Should be able to perform continuous operation for min 4 hrs with a single set of rechargeable bty or better and also a spare bty set to be provided	To be physically checked by BOO.		
	(j) It should have safety feature against accidental firing.	To be physically checked by BOO.		
	(k) Should have AC power charger of CE standard 2015 or above with facility to extend the length of the charger for min 15 mtrs.	To be physically checked by BOO.		
	(l) Should have facility to configure the system to control the ROV of same type.	To be physically checked by BOO.		
	(m) Should have operating temp : -20°C to +50°C.	National /international accredited lab certificate to be provided by vendor.		
8.	<b>Comn</b>			
	(a) Bi-directional wireless and wired data communication between the Control Station and ROV both having operation range of min 1KM & 300M respectively.	Compliance certificate to be provided by OEM and also to be physically checked by BOO.		

DRAFT TDs OF HEAVY LIFT ROV (Contd...)

<u>Ser No</u>	<u>QRs</u>		<u>TDs</u>	<u>Response from the firm</u>	
				<b>Compliant (Mention Yes or No)</b>	<b>Compliant (Mention Yes or No)</b>
	(b)	ROV should have wireless operational range of >1km line-of-sight and >300m in Urban (NLOS) environment for communicating and controlling ROV from operators console.	To be physically checked by BOO.		
	(c)	ROV should have a portable antenna to relay the wireless transmission in case line of sight is not available.	To be physically checked by BOO.		
	(d)	It should have two way Intercom/broad cast system between ROV & OCU using headset & microphone with ROV having a sensitive microphone to pickup acoustic signature, both at base station & target area.	To be physically checked by BOO.		
9.	<b><u>Firing System</u></b>				
	(a)	Wireless contact electrical terminals for disruptor firing.	To be physically checked by BOO.		
	(b)	Secured trigger system.	To be physically checked by BOO.		

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<u>Ser No</u>	<u>QRs</u>	<u>TDs</u>	<u>Response from the firm</u>	
			<u>Compliant (Mention Yes or No)</u>	<u>Compliant (Mention Yes or No)</u>
10.	<b><u>Service and Support</u></b>			
	(a) The equipment should be provided with the following :-			
	(i) Special Maintenance Tools.	To be physically checked by BOO.		
	(ii) Cleaning Kit.	To be physically checked by BOO.		
	(iii) Documents enlisting all tech specification and capabilities.	To be physically checked by BOO.		
	(iv) Illustrated spare parts list.	To be physically checked by BOO.		
	(b) Technical specifications including inspection criteria.	To be physically checked by BOO.		
	(c) User Handbook in English	To be physically checked by BOO.		
	(d) Specifications for Packing/ handling/ transportation/ storage.	To be physically checked by BOO.		
11.	Ruggedised and waterproof containers for ROV and Control Station.	To be physically checked by BOO.		