

**TERMS OF REFERENCE: CONSULTANCY FOR DESIGNING 5TH GENERATION FISHING VESSEL**

<b>RFP No. and Date of Issue</b>	SDFC/IU/2020/38
	21 <sup>st</sup> December 2020
<b>Project Name</b>	5 <sup>th</sup> Generation Fishing Vessel Design
<b>Purchaser</b>	SME Development Finance Corporation Pvt Ltd
<b>Address</b>	SME Development Finance Corporation, M. Kaneeru Villa, 2 <sup>nd</sup> Floor, Orchid Magu, 20212 – Male’ City, Republic of Maldives Phone: +960 3306999 Mail: <a href="mailto:info@sdfc.mv">info@sdfc.mv</a>
<b>Clarification Deadline</b>	The Vendors can send written queries via email <a href="mailto:procurement@sdfc.mv">procurement@sdfc.mv</a> before <b>1400hrs, 27<sup>th</sup> December 2020</b>
<b>Bid Submission Deadline</b>	All proposal shall be submitted via email: to <a href="mailto:procurement@sdfc.mv">procurement@sdfc.mv</a> before <b>1400hrs 10<sup>th</sup> January 2021</b>
<b>Project Duration</b>	Project duration is to be proposed as per Form 2
<b>Bid Validity</b>	90 Calendar days from the date of bid submission.
<b>Bid language</b>	Dhivehi & English

## 1. Background

Fishing has been practiced in Maldives for centuries, and over the years fishing vessels has undergone various stages of development. The traditional pole and line fishing vessels used in the Maldives locally referred to as a “*Dhoni*”, is vessel design unique to the Maldives. The design and craftsmanship have been mastered by Maldivian boat builders over the years and is quite unique in the sense that large fishing vessels have been built out of wood without a single paper-based drawing or calculation.

It has been well documented that fishing was conducted quite close to the shore often in the vicinity of the islands when the fishery first started. Sailing dhoni’s equipped with oars were used initially.

Over time fisheries sector has grown considerably and the vessels have undergone several marked development phases. With the advancement of the boat building industry, fishing vessels have grown in size and at present majority of the vessels now have FRP hulls instead of timber framed hulls that were a hallmark of traditional fishing dhonis.

Fisheries sector is a priority financing sector for SDFC and we have financed over 50 fishing vessels over the past 2 years. To further enhance our assistance to the Fisheries sector, we are currently seeking a consultant for designing of the 5th Generation Fishing Vessel which would cater to current requirements of the fisherman. Once the design is finalized, we intend to finance 5th generation fishing vessels through our financing facilities. The project will be implemented through partnership with the Ministry of Fisheries, Marine Resources and Agriculture (MoFMRA) and the Ministry of Economic Development.

### Historical changes to the vessel

Literature on boat building and fishing vessels is limited. The traditional process of boat building has not been documented thus it is hard to establish the main development stages of the fishing dhonis. Interviews with experts have been conducted to establish these stages. Following is a short note on the 4 generations of fishing vessels that have been used in the Maldives.

#### 1. First generation

As highlighted, sailing dhonis were initially used in the pole and line skipjack tuna fishery. In the early 1970s the government of Maldives in collaboration with Food and Agriculture Organization (FAO) started the “mechanization programme” which is effectively the first marked development stage in the design of dhonis. This programme which was aimed at retrofitting onboard engines on sailing dhonis was a major turning point in the pole and line skipjack tuna fishery of Maldives.

#### 2. Second generation

Expert interviews suggest that the second generation dhonis were mainly an upgrade to the design of sailing dhonis in light of the mechanization process. As mechanization became common, boat builders realized that space was limited on the back deck due to engine hold. To cater for this, the platform on the back deck commonly referred to as the “*kolhufilaa*”

*gandu*” was slightly modified in shape and size to allow more fishermen to fish on the back deck. Also, the hull which was previously left open in the middle were closed with removable wooden planks (*malhu*).

### 3. Third generation

The third generation of fishing vessels was again a major development phase in the Maldivian fishing industry. This design was led by the Ministry of Fisheries, Marine Resources and Agriculture and this stage is marked by the shift to FRP hulls from timber framed dhonis. This development came about during mid-1990s. Notably these vessels were larger in size compared to the previous generations and the vessels also water-sprays were introduced to the fishery through this development stage.

### 4. Fourth generation

This generation of fishing vessel brought about a major shift towards larger hulled fishing vessels with more hold space. Notably the fourth-generation vessels have a larger back deck and the engine is pushed further back towards the aft of the vessel to improve efficiency. These vessels have crew cabin space and are also bigger than the third generation of vessels.

## Shortcomings of the Current Vessel Designs

An assessment of the current vessel designs was conducted through interviews with relevant experts and fishermen by Ministry of Fisheries, Marine Resources and Agriculture. Initially, industry experts and naval architects were engaged to identify issues with vessel design that has to be modified or changed to improve the quality of catch, safety at sea and improve the overall fishing experience for the fishermen involved.

At a later stage, fishermen were interviewed to identify their needs and brainstorm on ideas on how the vessel design can be improved. Key areas for design improvement were identified through this methodology are given in Annex 1. After the interviews it was identified that there is a huge need for a new Fishing Vessel to cater the current demands of the fishermen.

## 2. Scope of Work

The consultant shall conduct a thorough analysis and prepare design(s) and detailed drawings for the construction of a fifth-generation fishing vessel that can be utilized in the handline and pole and line fishery in co-operation with the relevant stakeholders. The vessel will also double up as a training/research vessel that could replicate industry standards so that training and important fishery related research on bycatch, bait, quality of fish etc. could be conducted in commercial conditions.

The vessel should comply with the various international instruments on sea-safety and sea worthiness and should be built to a standard that allows fishing outside the EEZ of the Maldives.

The consultant shall undertake following duties:

1. The consultant shall prepare conceptual designs, detailed designs including construction drawings, BOQ and other necessary documents which are normally required by boatyards and classification societies, for the fifth-generation fishing vessel. The following are highlighted for emphasis.
  - a. Prepare the initial and conceptual designs for a multi-day pole and line tuna fishing vessel
  - b. Concept designs should be developed into 3D drawings which can then be used to produce photo realistic images or video which can add a new dimension to visualisation of the vessel
2. The consultant shall identify shortcomings and improvements based on the current demands of fishermen and other stakeholders. Given below are minimum requirements to be considered during the design of vessel
  - a. The vessel shall address the shortcomings and improvements, including but not limited to those given in Annex 1.
  - b. The vessel shall be retrofitted with solar panels to minimize its dependence on fossil fuels thus reducing the running costs of the vessel
  - c. Design shall be geared towards optimising productivity, fuel efficiency and speed
  - d. Design shall include on board fish handling and fish chilling systems such as RSW systems.
3. Identify construction standards and the cost involved in standardising the new design of the fifth-generation fishing vessel, which has on board fish handling and fish chilling systems, which could be used in pole and line fishing at high seas.
4. Investigate the implications, including the cost, of having the new fishing vessel built to class and entering into class after delivery with a recognised classification society, which is familiar with the region.
5. The consultant should also consider the need to upgrade the safety regulations for fishing vessels, identify key provisions which would be suitable for the Maldives for inclusion in such regulations. The 1993 Torremolinos Protocol, the FAO/ILO/IMO Code of Safety for Fishermen and Fishing Vessels (2005) and Voluntary Guidelines for the design, Construction and Equipment of Small Fishing Vessels (2005) should be used as a guide for that purpose.
6. All designs prepared under this consultancy would be the property of SDFC/GoM.

### 3. Qualifications & Experience

Consultant shall fulfil any one of the following options (A,B or C).

#### **Option A - Individual**

1. Naval Architect:
  - a. An accredited BEng degree, plus either an appropriate accredited Master's degree in Naval Architecture.
  - b. Minimum 10 years of experience in design and project management of vessel construction.
  - c. Minimum 10 years of experience in fisheries industry
  - d. Should be able to use the latest CAD and modelling software to enable optimisation in design, striving to be forward-thinking in their design process.
  - e. Should have experience in investigative work where existing vessels have experienced problems with sea keeping, handling or directional stability, the ability to produce clear and well-presented drawings and plans
  - f. Analytical skills to interpret technical information and drawings
  - g. Effective spoken and written communication skills for dealing with people both within and outside the engineering profession
  - h. Report-writing skills
  - i. Project management and leadership skills
  - j. candidate should provide information on completed jobs or related projects in fishing boat design and development.

#### **Option B – Team/Company/JV**

1. Naval Architect:
  - a. An accredited BEng degree, plus either an appropriate accredited Master's degree in Naval Architecture.
  - b. Minimum 10 years of experience in design and project management of vessel construction.
  - c. Should be able to use the latest CAD and modelling software to enable optimisation in design, striving to be forward-thinking in their design process.
  - d. Should have experience in investigative work where existing vessels have experienced problems with sea keeping, handling or directional stability, the ability to produce clear and well-presented drawings and plans
  - e. Analytical skills to interpret technical information and drawings
  - f. Effective spoken and written communication skills for dealing with people both within and outside the engineering profession
2. Marine Engineer:
  - a. An accredited BEng degree in Marine Engineering.
  - b. Minimum 10 years of experience in relevant field

3. Fisheries Expert
  - a. Minimum 10 years of experience in fisheries industry

### **Option C – Alternative Proposal**

An Interested party may submit an alternative proposal with adequate justification. The proposal shall include a list of key experts, their educational qualification and experience. The proposals should clearly define the roles and responsibilities of key experts and identify one member as the team leader.

## **4. Deliverables**

1. At least 3 Conceptual Designs (pdf, CAD files and 2 hardcopies) with a presentation
2. Detailed design (pdf, CAD files and 2 hardcopies)
3. Bill of Quantities
4. Design report including the engineering calculations
5. Feasibility report
6. Report identifying the gaps and key provisions to be included in the regulations

## 5. EVALUATION CRITERIA

Method of selection: QCBS – Quality and Cost based selection

### Evaluation of Technical Proposals

1. The Technical Proposals shall be evaluated on the basis of their responsiveness to the Terms of Reference, applying the evaluation criteria stipulated below. Each responsive Proposal will be given a technical score (St). A Proposal will be rejected if it does not respond to important aspects of the Terms of Reference or if it fails to achieve the minimum qualifying technical score indicated.

Criteria, sub-criteria, and point system for the evaluation of Technical Proposals are:

#### Points

- (i) Adequacy of the proposed methodology and work plan  
in responding to the Terms of Reference:

- a) Technical approach and methodology [20]
- b) Work plan [20]

Total points for criterion (i): [40]

- (ii) Key professional staff qualifications, experience, and competence for the assignment:

Total points for criterion (ii): [60]

The number of points to be assigned to each of the above positions or disciplines shall be determined considering the following two sub criteria and relevant percentage weights:

- 1) General qualifications [35%]
- 2) Experience related to the assignment [65%]

Total weight: 100%

Total points for criteria (i) and (ii): 100

The minimum technical score S(t) required to pass is: **75** Points

### Evaluation of Financial Proposals

2. The financial scores (Sf) of the Financial Proposals will be computed as indicated below:

$S(f) = 100 \times (F_m / F)$ , in which S(f) is the financial score, F<sub>m</sub> is the lowest price and F the price of the proposal under consideration.

### **Combined Scores**

- Proposals will be ranked according to their combined technical ( $S_t$ ) and financial ( $S_f$ ) scores using the weights ( $T$  = the weight given to the Technical Proposal;  $P$  = the weight given to the Financial Proposal;  $T + P = 1$ ) indicated:  $S = (S_t \times T\%) + (S_f \times P\%)$ .

The weights given to the Technical and Financial Proposals are:

$T = [0.7]$ , and

$P = [0.3]$

- The party achieving the highest combined technical and financial score will be invited for negotiations.

## **6. Documents to be Submitted**

All bids should be submitted with the following forms and any bids submitted without the forms will be automatically disqualified. Marks will be awarded based on the information on these forms. All submissions must contain two proposals:

### **Technical proposal**

Form 1: Application for Bid Submission (Annex 2)

Form 2: Bidder Profile & Technical Proposal (Annex 3)

### **Financial Proposal**

Form 3: Price Schedule (Annex 4)



# Annex 1

## A. Key shortcomings identified by industry experts and fishermen

Eight key areas were identified through interviews with the industry experts and fishermen.

Key shortcomings	Remarks
1. Poor arrangements for preservation of fish on board	<ul style="list-style-type: none"> <li>- Majority of the fishing vessels use ice for maintaining the quality of fish on-board fishing vessels.</li> <li>- Even though vessels are FRP vessels, many vessels do not have sufficient levels of insulation and as a result ice cannot be stored for extended periods.</li> <li>- Fishermen are not aware of the process and the need for proper use of ice thus the amount of ice used is insufficient.</li> <li>- The availability of ice for purchase is an area of concern for many fishermen.</li> <li>- Use of onboard ice making facilities is not common in Maldives</li> </ul>
2. Low survival rate of bait/ high wastage	<ul style="list-style-type: none"> <li>- Bait fishing operation occurs prior to actual fishing operation</li> <li>- Bait fish are kept live in a bait tank</li> <li>- Low survival rates of bait; mainly due to design of bait tanks.</li> <li>- Bait tanks to be modified based on experience from other parts of the world to improve water flow and availability of oxygen in the bait tanks.</li> </ul>
3. Low freeboard	<ul style="list-style-type: none"> <li>- This issue has been highlighted by various experts.</li> <li>- Low freeboard at the aft of the vessel is necessary for the fishing operation in Maldives.</li> <li>- There have been no reports of any incidents due to the issue of low free board.</li> <li>- A major change in the vessel design has to be brought about to rectify the issue.</li> </ul>
4. Fish being kept in the sun on the open deck	<ul style="list-style-type: none"> <li>- Fishing operation is short and intense. Hence fishermen are unable to store the fish in the storage wells as fish are landed.</li> <li>- Vessel design has to be modified so that fish are automatically transferred to the storage wells as they are landed.</li> <li>- Fish are transferred to storage wells during the short intervals in between the fishing events.</li> </ul>
5. Damage to fish during the harvesting process	<ul style="list-style-type: none"> <li>- It is impossible for fishermen to ensure fish is landed with care during the fishing process due to the intensity of the operation.</li> <li>- Barbless hooks are used to de-hook the fish a quick motion during fishing</li> <li>- Fish are landed on fibre coated decks that are hard.</li> <li>- Mechanisms have to be established to ensure fish are landed on a soft surface</li> </ul>

<p>6. Difficulties in offloading catch</p>	<ul style="list-style-type: none"> <li>- Fishing operation occurs in intense bursts.</li> <li>- Fish that are stored in the storage wells after each fishing event is offloaded using small baskets at fish landing centers and collector vessels.</li> <li>- This is a time-consuming process that further damages the fish during the transfer process.</li> <li>- Modifications have to be made to the storage wells and the openings to rectify this issue</li> </ul>
<p>7. Limited technologies to improve the efficacy of the fishery</p>	<ul style="list-style-type: none"> <li>- The tuna fishery in Maldives is less technologically advanced in comparison to some developed fishing nation.</li> <li>- Use of fish finders, bird radars, modern binoculars are minimal</li> <li>- Catch is reported in paper-based formats. This is time consuming and difficult for fishermen.</li> <li>- New technology has to be introduced to the fishery to improve this aspect of the fishery.</li> </ul>
<p>8. High fuel consumption and low steaming speed</p>	<ul style="list-style-type: none"> <li>- The traditional fishing methods used in the Maldives (pole and line and handline) are often regarded as economically less efficient compared to industrial scale fishing.</li> <li>- To address this criticism, it is important to further improve on the hull design to improve on economic efficiency and speed of the vessel.</li> <li>- It is also critical that storage space (for fuel and water) is increased through the change in hull design so that fishing vessels can cut down on travel time back and forth for provisioning.</li> <li>-</li> </ul>

## B. Proposed design improvements for the Fifth-Generation Fishing Vessel

The 5<sup>th</sup> generation of fishing vessels should address the modern-day challenges to fishing industry as a whole. This design and modifications should also address the growing concerns of the processing industry with regards to the quality of fish and should also seek to address the difficulties faced by the fishermen during the fishing operations. Furthermore, any changes to the design should ensure that the overall fishing experience is a better experience to the fishermen. This would play an important role towards enticing youth to the industry in the future.

Following table succinctly describes the approaches/ activities that have to be undertaken to address the shortcomings identified through various consultations.

Shortcomings	Approach to rectify the shortcomings
Poor arrangements for preservation of fish on board	<ol style="list-style-type: none"> <li>1. Improving insulation of the storage tanks by increasing insulation</li> <li>2. Installation of RSW systems on board the fishing vessels.</li> <li>3. Fishers being trained on the procedures and good practices on fish preservation through ice</li> </ol>
Fish being kept in the sun on the open deck	<ol style="list-style-type: none"> <li>1. To modify the back deck so that fish is automatically transferred to storage wells. <i>A "Gravity Fish Conveyor" is to be designed for the back deck (notes appended).</i></li> </ol>
Damage to fish during the harvesting process	<ol style="list-style-type: none"> <li>1. Modify the back deck to ensure that the force of impact on the deck is minimized. <i>A "Canvas Impact Diffuser" to be used to minimize force of impact (notes appended).</i></li> </ol>
Difficulties in offloading catch	<ol style="list-style-type: none"> <li>1. Modify storage wells to and openings so that fish can easily be offloaded.</li> <li>2. Consider the use of a lightweight crane to offload metal crates (loaded with fish) from the vessel to the wharf. <i>Metal crates to be inserted to the storage holds so that fish can be offloaded using cranes at landing centers (notes appended).</i></li> </ol>
Limited technologies to improve the efficacy of the fishery and vessel	<ol style="list-style-type: none"> <li>1. Use modern new fish finders to locate schools of fish</li> <li>2. Use Image Stabilizing binoculars to search for free swimming schools and sea birds</li> <li>3. Use solar panels on-board fishing vessels to minimize dependence on fossil fuels</li> <li>4. Use of vessel tracking devices with internet connectivity to enable real time reporting of catches and to improve overall safety at sea.</li> <li>5. Use of bird radars on board the fishing vessel to potentially contribute towards improved catches</li> </ol>

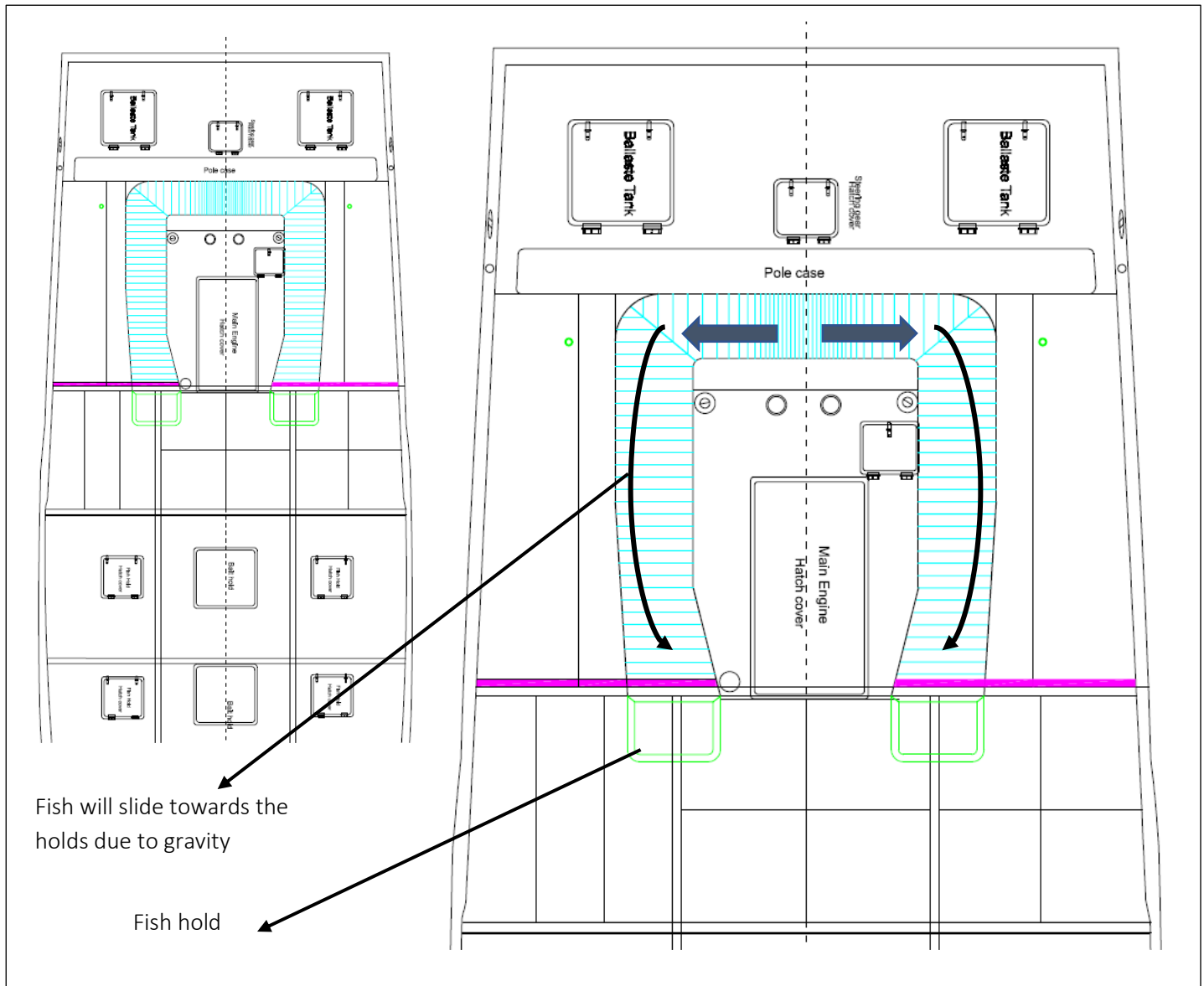
	<i>Image stabilizer binoculars require a swivel stand (further notes on stand design and use of solar panels appended).</i>
Issues with the survival rates of bait	<ol style="list-style-type: none"> <li>1. Modify bait tank design to increase the survival rates of the bait.</li> <li>2. Train fishers to on good practices of bait handling <i>Modify bait tank design based on the Japanese style bait tanks (notes appended)</i></li> </ol>
Low freeboard	<ol style="list-style-type: none"> <li>1. Promote the use of life jackets/ helmets etc. to address the safety concerns. <i>Low free board is essential to the fishing operation and this cannot be compromised).</i></li> </ol>
High fuel usage, low steaming speeds and limited storage space	<ol style="list-style-type: none"> <li>1. Consider new hull designs or other changes to the vessel to improve fuel efficiency and the steaming speed of the vessels whilst contributing towards additional storage space for fuel, ice and other amenities.</li> </ol>

## Details of key improvement methods

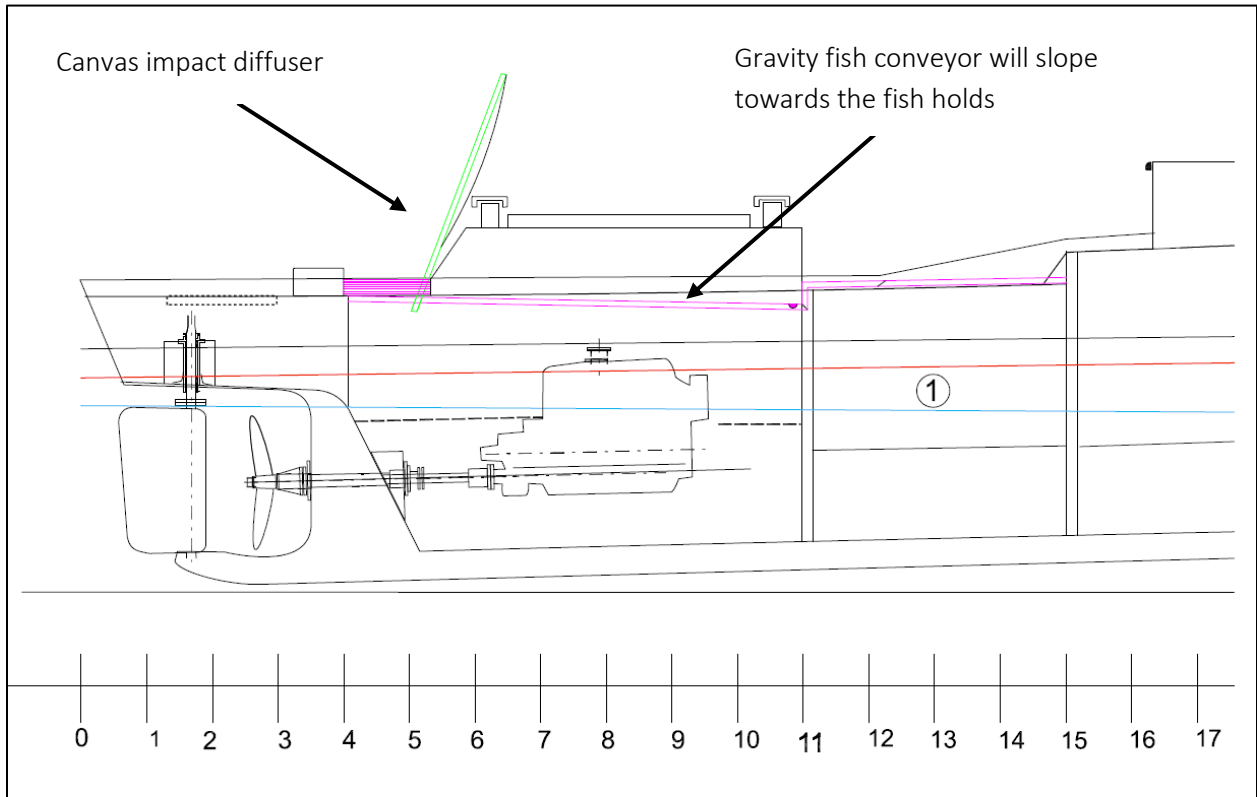
### 1. Gravity Fish Conveyor and Canvas Impact Diffuser

The Gravity Fish Conveyor (GFC) and Canvas Impact Diffuser (CID) is designed to work in tandem. The CID will effectively be the fish receiving point (landing point). Once the fish is landed on to the CID the fish will then slide on to the GFC which will transfer the fish to the assigned well. The GFC will have a slight angle to it so that fish will be transferred to the wells based on gravity and the slippery nature of the conveyor.

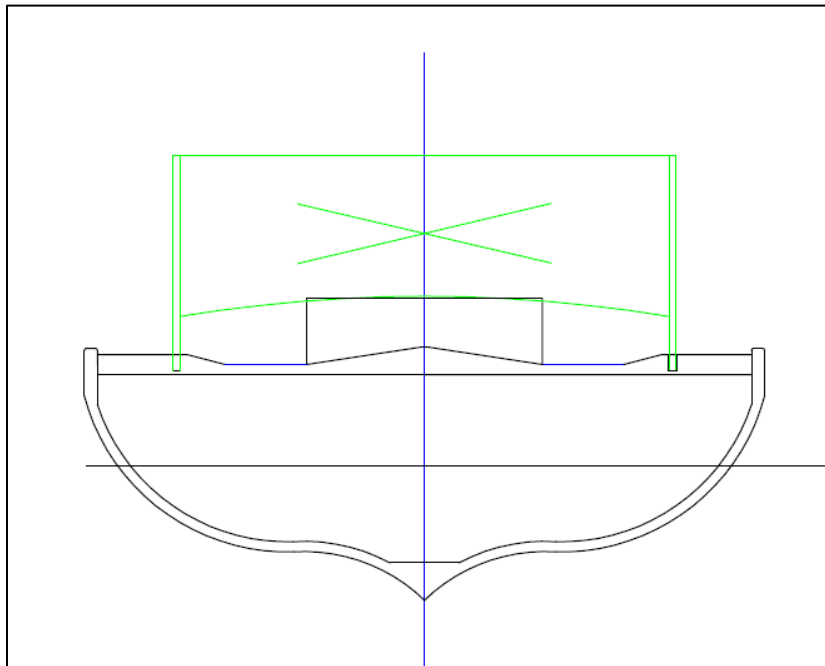
### Top view of Gravity Conveyor Belt



### Side view of Canvas Impact Diffuser and Gravity Conveyor Belt



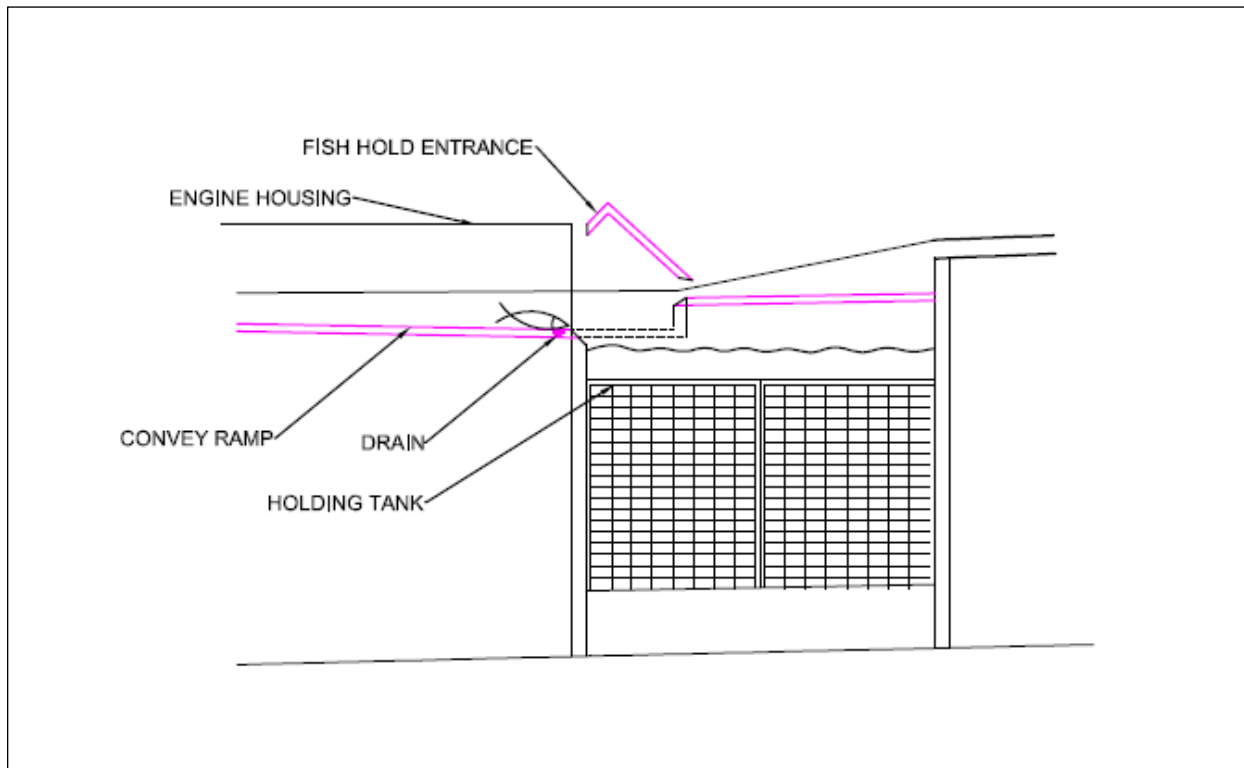
### Aft view of Canvas Impact Diffuser



## 2. Use of metal crates to offload fish

To ease the process of offloading fish there are two specific activities that has to be undertaken. As a first step the storage openings has to be increased to cover the length and width of the storage well. As a second step metal crates will be specifically crafted to fit the storage wells of the fishing vessels. These metals crates will have sufficient openings to allow slurry and ice to pass through from one crate.

Once at the landing facility these crates can then be hoisted using derricks at the shore-based facilities or lightweight booms fixed to the vessels with minimal intervention from the fishermen.



### 3. Use of solar panels on fishing vessels

The top of the wheelhouse of the fishing vessels will be fitted with solar panels to capture sunlight. Storage batteries will also be connected to the solar panels.

The energy captured from these solar panels will be used to power the lightings and other small equipment and appliances used in the wheelhouse. Furthermore, the pumps and other auxiliary devices used during the fishing operation can be powered through solar energy depending on the number of solar panels that can be fitted on to the vessel.

### 4. Use of image stabilizing binoculars

Ordinary binoculars are used by local fishermen to search for fish schools and birds. These binoculars do not have a very long range and prolonged use can cause a lot of stress to the eyes.

It is proposed that Image stabilizing Binoculars will be introduced in the Maldives through the fifth generation of fishing vessels. Image stabilizing binoculars are now used by a lot of fishermen throughout the world to search for free swimming fish schools and birds. These binoculars can be and will be used for prolonged periods on the fishing vessels, but this would require the binocular to be mounted on a swivel stand which would allow easy manoeuvring. An easy mount swivel stand will be fitted in the wheelhouse so that the skipper will always have easy access to the binoculars.

