

Code of Containment

for the Responsible Containment of
Farmed Atlantic Salmon in Maine Waters

Adopted By
The Maine Aquaculture Association
and its
Member Salmon Farms

October 18, 2002

Purpose

This Code is intended to encourage the continued development of responsible domesticated salmon aquaculture in Maine waters. Domesticated salmon are defined here as reproductively viable salmonids that have been cultured in captivity for greater than two generations removed from river specific stocks. This Code is predicated on a risk management approach and seeks to minimize potential escapement of domesticated salmon .

This code addresses the most significant sources of risk by focusing on net strength, equipment integrity and predator deterrence measures. Future updates and changes will be made according to current scientific knowledge, Maine specific studies, global and regional industry practices and appropriate technological advances.

This code is intended to serve as a set of technical standards which all Atlantic salmon farming facilities in the state of Maine will utilize as minimum operating standards. These standards and operating practices form the basis of the Maine Aquaculture Association's (MAA) Containment Management System (CMS) and the site specific plans developed by member farms. Current versions of this code are to be appended to all site specific CMS plans. It is anticipated that the standards within this code will be regularly reviewed and updated.

Equipment Standards

Nets

1. Nets will only be obtained from a manufacturer or supplier whose equipment design specifications and manufacturing standards meet generally accepted standards prevalent in the aquaculture industry.
2. Net design and specification shall be commensurate with the prevailing conditions of the site provided that twine strength be no less than 210/60 for smolt containment and 210/80 for grow out.
3. A 4-point stress test shall be performed on all nets with more than three years of use in the marine environment when the net is pulled out and sent for cleaning. The manufacturer or Code compliance auditor shall conduct the stress test. The manufacturer or leaseholder shall retain documentation of test results for the remaining life of the net. The stress testing protocol and minimum breaking strengths are:
 - a. The stress test shall be conducted with an electronic dynamometer or other tension scale instrument;
 - b. For each point tested, the reported result shall be the average of three breaks;
 - c. The four points to be tested on each net are:
 - i. the jump skirt or area between the water line and the top line
 - ii. the next two meters below the jump skirt
 - iii. the side panels
 - iv. the bottom;
 - d. If components i or ii fail the stress test, the net may be repaired to meet the standard and returned to service. If components iii, iv fail the stress test, the net shall be retired;
 - e. Minimum breaking strengths for new nets and bottom line and minimum strengths required for nets before replacement are:

	Mesh Size (inches)	Minimum Twine Rating	New Net Strength (pounds)	Replacement Threshold (pounds)
S0 containment	$\frac{3}{4}$ -1 ^{1/8}	210/40	140	70
Smolt containment	1 ^{1/8} -1 ^{3/8}	210/60	185	80
1SW/2SW containment	1 ^{7/8} -2 ^{3/8}	210/80	200	120
Predator curtains	3-6	210/160	300	160
Bottom line		½" line	1500	

4. Each net in active service shall be marked with an inventory control number, which shall also appear on a written maintenance record for that net, kept by the lease holder or the net manufacturer.
5. Each numbered net in active service shall be subject to a written maintenance record. Maintenance records will track the net by manufacturer, date of deployment and time in water, in-water inspection reports and on-site corrective actions, dates of shore-side cleaning, maintenance and stress testing, time to failure and final disposition of a net that has been condemned or retired. The leaseholder or manufacturer will maintain the maintenance log until an annual performance audit is completed following the removal of the net from service.
6. All nets in use shall be U.V. protected. The use of dyed or otherwise presaturated nets is encouraged.
7. Nets will be secured to the cage collar such that the latter bears the strain and not the handrail of the cage. Net weights when used shall be installed in such a manner as to prevent chafing. It is encouraged that wear patterns when detected have a second layer of net added that extends one foot above and below the wear points.
8. The use of weight rings is encouraged at appropriate sites. Where net weights are deployed, they shall be installed in a manner that prevents chafing.

Cages

1. Cages will only be obtained from a manufacturer or supplier whose equipment design specifications and standards meet generally accepted standards prevalent in the aquaculture industry.
2. Cage design and specifications shall match the normal maximum conditions likely to occur at a site.
3. Lease holders shall exercise and document due diligence in the evaluation of new cage designs through field trials, consultation with growers using the design or a comprehensive analysis of the manufacturer's performance trials to ensure compatibility with site conditions and containment objectives.
4. Each cage in active service shall be marked with an inventory control number, which shall also appear on a written maintenance record kept by the lease holder. The maintenance record shall record the name of the manufacturer, the year produced, the field assembler and the date deployed. The record should also track all maintenance conducted: the nature of the maintenance, the date conducted, any supporting documentation for new materials used, and who conducted the maintenance.

Moorings

1. Mooring design shall be compatible with the cage system and site conditions and shall provide a maximum resistance of no less than 175 percent of the calculated lateral loading on the cage deployed with fouled netting in 90 mph winds. Any displacement of cages or moorings during storms other than movement normally associated with anchor setting shall require the recalculation of the load factor at 100 mph winds and an increase in the reserve capacity of the moorings to 200 percent. This provision shall not be construed to require professionally engineered and certified mooring plans, but may be met by the use of standard calculations such as those presented to the American Society of Agricultural Engineers in Mannuzza and Riley (1989) appended hereto.
2. Site operators are encouraged to inspect and tune their mooring systems as needed
3. Moorings shall be installed in consultation with the cage manufacturer or supplier. Rigging tension shall be maintained to installation standards.
4. The following minimum equipment standards mooring lines and connections will be maintained:
 - a. Lines from anchors to compensator buoy 1 1/2" diameter polysteel or equivalent
 - b. Lateral lines 1 1/2"
 - c. Grid lines 1 5/8" floating grids
 - d. Compensator buoys 58" diameter, 1100 L³ steel or foam filled HDPE
 - e. Y's for 70 and 100 m cages 1"
 - f. Chain 1" diameter (open link)
 - g. Connector plates ≥ the breaking strength of the largest rope, chain or cable attached to the plate
5. Shackles used in mooring systems will be no less than 7/8" and wire tied. Safety shackles may also be used. 1 1/8" shackles may be used with HD thimbles.
6. New components will under go their first inspection no later than 2 years after deployment.
7. Annual visual inspections by a diver or camera shall be conducted on subsurface mooring components for replacement of shackles and ropes. Chaff points shall be identified and subject to regular underwater inspection and removal of marine growth.
8. Mooring systems shall be hauled out of the water for a visual inspection of all components at least every six years.

Fresh Water Hatchery Containment

1. Hatcheries will use normal containment methods generally accepted as standard in the aquaculture industry. Where hatcheries are located in close proximity to ESA rivers containing runs of river run salmon, the following minimum containment procedures will be implemented:
2. For all fish 2-5 grams in size there should be a minimum of at least 3 barriers or screens, with a mesh size appropriate to the size of the fish, between fish being reared and access to water bodies outside the hatchery.
3. For all fish greater than 5 grams in size there should be a minimum of at least 2 barriers or screens, with a mesh size appropriate to the size of the fish, between fish being reared and access to water bodies outside the hatchery.

Operating Procedures

Site Operation

1. All lease sites will be clearly marked in accordance with the lease site's permit for fixed private aids to navigation from the USCG and Maine Department of Marine Resources lease marking regulations.
2. When designing, constructing and/or installing farm gear and equipment, care should be taken to reduce the risk of gear failure and loss.
3. All farm gear and equipment should be regularly inspected and maintained.
4. When installing farm gear on a site careful consideration should be given to the method of deployment and anchoring, specific site location, worker safety, product quality and animal welfare.

Site Selection

1. Lease holders should consider the impacts to containment of the following aspects when selecting a potential site:
 - a. Frequency of extreme weather;
 - b. How often do weather conditions limit grower's ability to access farm animals and perform basic husbandry;
 - c. The distribution and prevalence of potential predators
2. When practical, sites should be selected that minimize the impacts of the aspects listed in 1.

Fish Transfers

1. Routine fish handling for smolt placement, grading or cage transfer shall be conducted in appropriate weather conditions and under constant visual supervision of at least one person
2. Harvesting shall be conducted by pump or fully securable braille net in appropriate weather conditions. Braille nets will only be obtained from a manufacturer or supplier whose specifications meet generally accepted standards prevalent in the aquaculture industry.
3. Braille nets shall be fully closed before clearing the perimeter of the sea cage or the elevation of the jump skirt and shall not be opened until centered over the dewatering table at a height no greater than 24 inches. Dewatering tables shall be designed with sloping or elevated sidewalls.

Predator Deterrence

1. If a predator problem exists for a site, predator deterrence systems must be deployed, excepting periods of normal maintenance and when there are no fish in the cage or tank. Predator deterrence systems should be appropriate to the predator and shall be maintained in good operating condition.
2. Jump nets and top nets shall be kept tightly fastened to the top of the hand rail at all times in order to deter predator incursions.
3. It is encouraged that a variety of deterrence methods are employed in such a manner as to prevent predator acclimation or habituation.
4. It is encouraged that operators use deterrents in combination with operational practices and production strategies that take into account predator life cycles and ecology in order to minimize the potential for interactions between farm animals and predators.
5. Mortalities shall be removed from cages at least weekly, weather permitting. Daily mort removal is preferred.
6. All predation events must be logged and the written record maintained until an annual performance audit is completed.

Vessel Operation

1. All vessel operators shall receive appropriate training in the operation of the vessel.

2. Site operators should develop a Standard Operating Procedure (SOP) for all routine vessel operations. The SOP should minimize the risk of damaging nets and/or mooring system components with the propeller of the vessel.
3. When mooring barges on a permanent or semi-permanent basis, local current and wind patterns should be considered. The mooring location should be selected so that in the event of a vessel breaking free of its moorings the chance of the vessel impacting a cage is minimized.

Storm Preparation

1. Sites shall be selected and cage systems deployed in a manner that limits exposure to prevailing winds, open seas and predictable storm tracks.
2. Lease holders shall prepare written storm preparation procedures, which identify site specific vulnerabilities associated with items such as rigging, bridles, moorings, fasteners and drift-prone equipment subject to storm damage.
3. Spray tarps shall be deployed where appropriate on windward cages during winter to prevent jump net icing and sagging.