ULTRATECH INTERNATIONAL, INC.

Ultra-Rapid Boom Handling Guide

UltraTech International, Inc. · 11542 Davis Creek Court, Jacksonville, Florida 32256 USA
1-904-292-1611 · spillcontainment.com

USING THE OIL BOOM

GENERAL

These instructions are based on years of experience with oil spills under the widest variety of conditions in offshore and inshore waters the world over. They should be read carefully and, to assure maximum speed in deploying the booms and effectiveness in controlling a spill, should be followed as closely as conditions permit.

A workboat and crew should be available at all times. We urge that personnel be trained and periodically drilled before emergency action is required.

At the time the boom shipment is received from the manufacturer, open it to locate the identification plates on each section and record for future reference.

BOOM STORAGE

A storage location must be selected for your oil boom so that it will be readily accessible to the water for immediate use. After use and after boom is cleaned, the boom must be returned to the storage location ready for future use. Various methods of storing boom have been devised to keep booms ready for any emergency. The three most common methods are storage on the dock or shore line, in-water storage, and storage on the deck of a barge or float.

Storage on shore is probably the most common method. Boom stored out of water should be well ventilated to protect it from excessive heat and covered to protect it from ultra-violet damage from the sun.

No ice should be present where boom is stored in the water. In-water storage is common where ships and barges must be boomed during loading and offloading operations. When stored in the water, lengths of boom can be strung between buoys as if the boom were in a pen. Figure 1-1 shows such an installation. Boom stored in this manner should not be allowed to chafe against the dock.

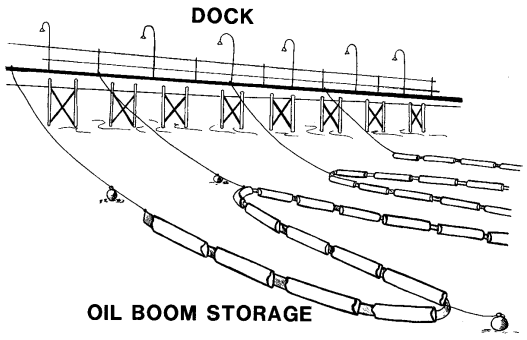

FIGURE 1-1 WATER STORAGE OF OIL BOOM

CAUTION: An oil boom which is in the water continually requires periodic maintenance to remove accumulations of marine growth. If marine growth is not removed, the boom will sink no matter how much reserve flotation is provided.

An oil boom stored on a float or oil spill barge has both the advantage of in-water storage and storage on land. It is always at the water level, ready for immediate use. When not in use, it should be afforded a degree of protection from the elements. An oil boom stored on the deck of your workboat can be moved rapidly to the deployment site and then launched into position.

All three methods are very effective as long as there are no obstructions between the storage site and the deployment site. If there are obstructions, such as the edge of a dock or a rocky shoreline, any combination of ramps, chutes, and/or dock edge rollers will simplify launching and retrieving booms. Figure 1-2 shows a typical dockside installation of an oil boom with a boom roller to assist launching and retrieval.

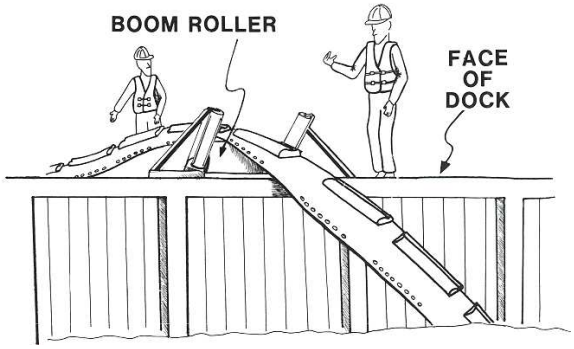

FIGURE 1-2 BOOM ROLLER

LAUNCHING THE BOOM

Launching an oil boom looks easy to the amateur—until he tries it. To prepare the boom for launching, attach the boom tow line onto the bridle or towing bit on the boat. As soon as the boom hits the water, the wind and current begin to exert a force on it. The success or failure of the launch often depends entirely upon the boat operator and his ability to judge the sideward movements of the boom caused by the current and/or wind.

Do not attempt to hold the tow line by hand. Pull the first few float segments of boom straight out before speeding up. If a current is running, head the boat up into the current so that the boom comes straight out from the storage area. The exact course you steer into the current can only be determined by practice at your location.

Do not attempt to go too fast when launching the boom. Excessive speed could subject the boom or anyone near it on the shore line to unnecessary risks. Have one boat crew member observe the launching of the boom. In the event the boom becomes tangled in the storage box or some other problem arises, he can alter the boat operator to stop the boat for correcting the situation before resuming the operation. Once all of the boom is in the water, speed may be increased.

BOOM DEPLOYMENT

A plan should be made up in advance showing how the boom will be secured to keep it in position after deployment to the site. It may be secured by attachment to buoys, anchors, and/or bulkhead risers. For shoreline termination, the boom must be pulled above the high water mark on shore and secured in place. If there is nothing substantial enough to tie the boom to, a Danforth type anchor or a stake driven into the ground can be used. See Figure 1-3.

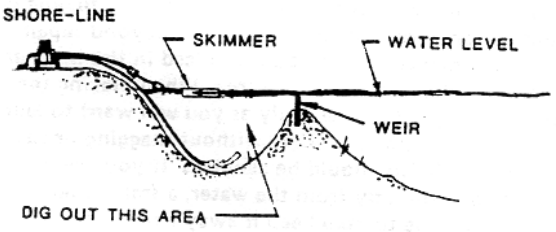

FIGURE 1-3 SHORE POINT TERMINATION OF OIL BOOM

In some cases, to provide a smooth, flat shoreline seal at the termination point, it may be necessary to make an excavation using a shovel or backhoe. Sorbent materials may be used to complete the seal.

To deploy a boom which is to be permanently installed, bulkhead risers and/or preplaced buoys and anchors must be available for attachment to it. If using a bulkhead riser, attach one end of the boom to it first. If connected to the buoy and anchor first, a load may build up on the boom making it difficult or impossible to connect the other end to the bulkhead riser.

When deploying a boom around a ship this is offloading, place it at a predetermined distance away from the ship using ground tackle and the factor installed boom anchor points. This will form an area where a spill can collect and be directed by the boom and the prevailing wind and current conditions to a collection area for recovery. See Figure 1-4.

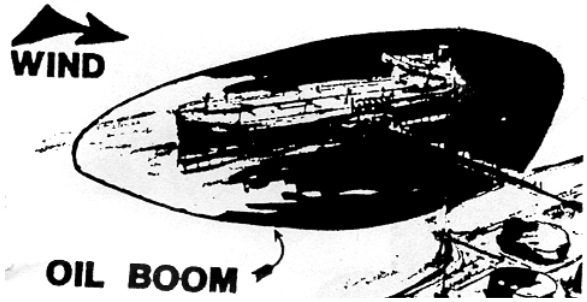

FIGURE 1-4 BOOM AROUND SHIP

To deploy a long length of boom (250' or more), do not attempt to pull all of it against the current. Anchor points supplied on many booms provide convenient intermediate towing points. Pull only 100' (30.5m) of boom against a current at a time. Figure 1-5 shows this procedure.

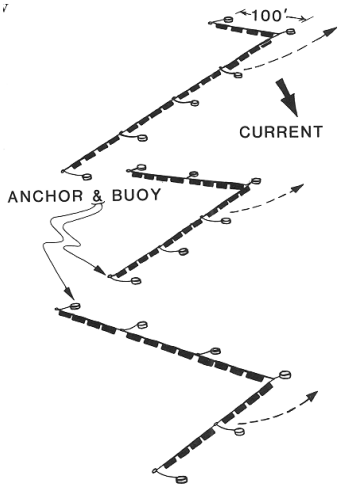

FIGURE 1-5 ANCHORING BOOMS AT 100-FT. (30.5 M) INTERVALS

If the boom has to be towed against a current to a termination point upstream, proceed with boom in tow to the shoreline spot where the boom will terminate. Secure the end of the boom that is being towed at this shoreline point and then proceed downstream and pick up the other end. Proceed upstream again staying close to the boom and the shoreline. Little difficulty maneuvering the boat will be encountered. If, however, you make too wide a turn and then head into the current, you may never reach your planned upstream mooring location. When the boom has been towed past the upstream mooring location, maneuver the boat out into the current and proceed to the location where you will drop the upstream anchor. See Figure 1.6.

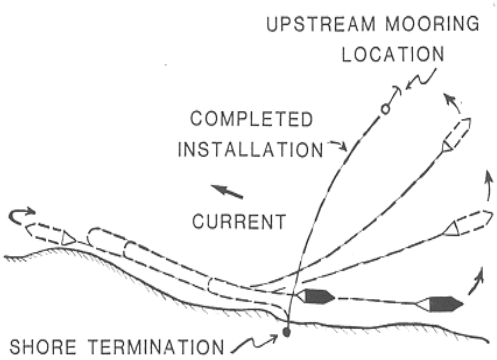

FIGURE 1-6 UPSTREAM MOORING LOCATION

When you are about to make a turn, slow the boat, make the turn, and proceed slowly until at least 20' (6.1m) of boom is directly behind the boat. Then boat speed may be increased. This procedure will prevent the boom from rolling and twisting on turns.

NOTE

Always use a bridle when towing an oil boom as shown in Figure 1-7. Simply attaching the boom to one cleat or the other will make steering the boat very difficult.

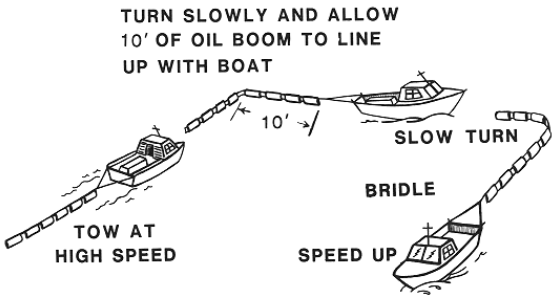

FIGURE 1-7 TOWING PROCEDURE FOR 180º TURN

As soon as a boom has been deployed and secured to contain a spill, since quick changes in wind direction are common, a second boom to enclose it should be installed.

HIGH CURRENT PROBLEMS

Containment of oil in water velocities in excess of .9 knots (90 fpm – 27.43m/min.) appears impossible. Fortunately this is not always the case. By proper deployment and utilization of booms, this problem of oil escaping under the boom can be controlled.

There are two basic procedures that should be followed in high current situations. The first is to angle the boom. By angling the boom, the actual velocity can be reduced to an apparent velocity against the face of the boom. (See Table 2-1.)

True Water Velocity			Angle
Knots	Ft. per min	Meters/min	
1.01	102	31.18	30°
1.06	107	32.72	35°
1.11	113	34.26	40°
1.18	120	36.42	45°
1.27	129	39.2	50°
1.39	140	42.9	55°
1.53	155	47.23	60°
1.72	177	53.09	65°
1.98	201	61.12	70°

Table 2-1 ANGLES TO REDUCE APPARENT VELOCITY OF CURRENT

While angling a boom does not completely contain the oil, it does reduce the amount of oil that will escape. The second procedure is to angle a second boom parallel to the first to set up a double booming system. Controlling the oil in this way provides a means of directing the oil along the boom line to a collection point at the shoreline.

Some important points to be stressed in the angled deployment of two or three parallel booms are—

1. The upstream boom DOES NOT CONTINUE to the shoreline. It should normally terminate 10' (3m) to 20' (6m) away.
2. The distance between the two booms should be between 4' (1.22m) and 6' (1.83m). If proper planning of anchor points on the booms is made in advance, tether lines can be readily used to attach the second boom to the first eliminating much difficulty in anchoring. Short tether lines attached between the booms at each of the anchor points will keep boom spacing constant. See Figure 1-8.

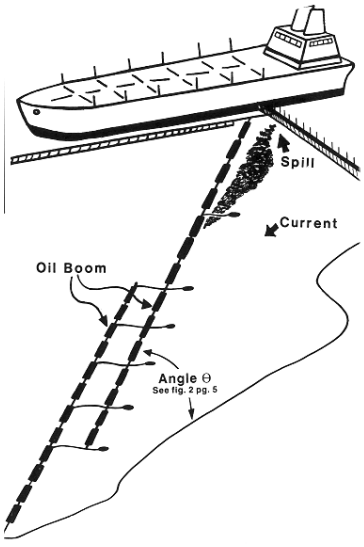

FIGURE 1-8 DOUBLE BOOMING

Almost every stream with a fast moving current has numerous back eddies where the water is relatively still. These occur primarily where there are indentations in the bank. If booms are deployed in such a way as to guide the oil into these areas, control and removal is made easier by using these areas as oil collection points. See Figure 1-9.

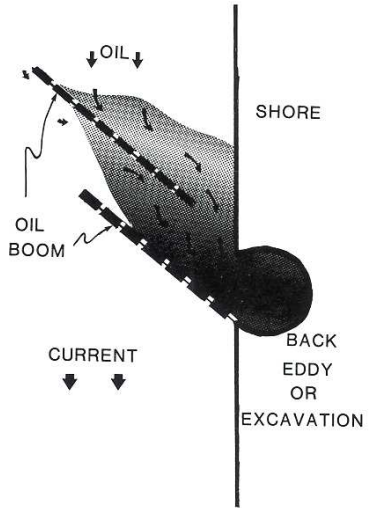

FIGURE 1-9 DOUBLE BOOMING USING BACK EDDIES

At the shoreline there is normally low current, if any. If a high current does exist at this point, it is recommended that a section of the bank be excavated as shown in Figure 1-10 to allow for an adequate collection point for oil removal. IT IS ESSENTIAL THAT OIL BE REMOVED RAPIDLY UNDER THE ABOVE CONDITIONS, OR THE OIL WILL EVENTUALLY ESCAPE AND YOU WILL SIMPLY HAVE TO START THE WHOLE PROCEDURE OVER AGAIN DOWNSTREAM.

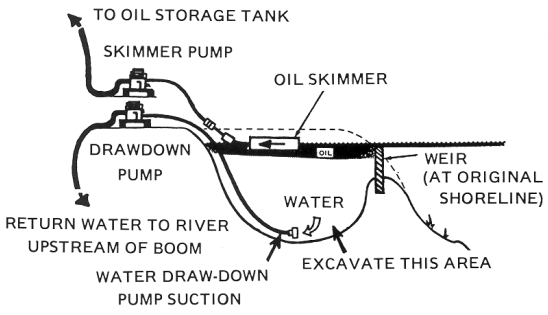

FIGURE 1-10 CUT-AWAY OF OIL COLLECTION PIT WITH WEIR

Using this method, water can be pumped from the pit allowing oil to follow the boom direction and collect in the pit. The oil can then be removed from the pit with the aid of a skimmer.

Every boom that is actually performing a function should have a man assigned to it. His responsibility would be to adjust the boom's position periodically as required by wind and/or tide and to stop any leaks or notify the designated authority of such leaks. Many spills have escaped because no one slacked off on a tight line as the tide went out.

BOOM ATTITUDE IN HIGH CURRENTS

If the boom is perpendicular to the current, the maximum depth of oil does not always occur directly at the face of the boom but at a distance in front of the boom. When the critical velocity has been reached, oil will first start to escape from the head wave. There is a considerable droplet breakaway. Shortly thereafter (with an increase in velocity of only 5 to 10 fpm – 1.52 to 3.05 m/min.) small sheets of oil will escape from region "C." See Figure 1-11.

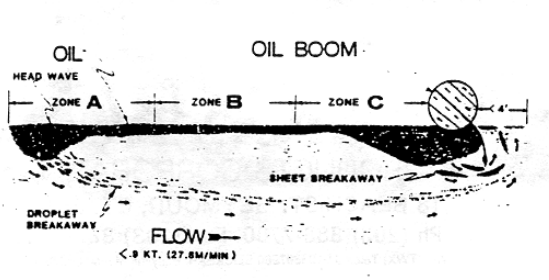

FIGURE 1-11 CONFIGURATION OF OIL AGAINST BOOM

THE FORCES AFFECTING BOOMS

Generally, there are three forces which are imposed on an oil boom while it is being used. These forces are current loading, wind loading and loads imposed while towing.

EFFECT OF CURRENT ON OIL CONTAINED BY BOOMS

When an oil spill barrier is place in the water, it acts like a dam. In a moving body of water, the surface water being held back by the dam will accelerate in an attempt to keep up with the water flowing under the boom (dam). The velocity of the surface water flowing past the bottom edge of the skirt is a function of the skirt depth. As the skirt depth increases, so will the distance that the

restricted water has to travel to catch up to the main stream. As the velocity of the water traveling under the skirt increases, the spilled material at the surface is drawn under the boom. The speed at which this material is drawn under the skirt is referred to as critical velocity. This effect accounts for most of the loss of oil from the up current side of the boom. See Table 2-2.

Current Knots	Velocity Feet per Min.	Velocity Feet per Sec.	Pounds per Linear Foot			
			6"	8"	12"	24"
0.5	51	.84	0.69	0.90	1.35	2.71
1.0	101	1.69	2.71	3.66	5.48	10.97
1.5	152	2.53	6.15	8.19	12.39	24.58
2.0	203	3.37	10.90	14.54	21.81	43.61
2.5	253	4.22	17.10	22.79	34.19	68.38

These figures are applicable only for booms deployed perpendicularly to the current and with the skirt on a vertical plane.

Current Knots	Velocity Feet per Min.	Velocity Feet per Sec.	Kilograms per Meter			
			6" 15.24	8" 20.23	12" 30.48	24" 60.96
0.5	15.43	0.26	.095	.124	.187	.375
1.0	30.87	0.51	.375	.506	.758	1.517
1.5	45.3	0.77	.850	1.132	1.700	3.398
2.0	61.73	1.03	1.507	2.010	3.015	6.029
2.5	77.17	1.29	2.364	3.151	4.727	9.454

Table 2-2 – Current Load Per Skirt Depth

OIL MOVEMENT ON WATER

Movement of oil on water is relatively independent of current direction; however, current will affect its direction with winds of less than 7 knots. When dealing with winds of 7 knots or greater, wind will become a primary driving force controlling the rate of spread. Waves can also have an effect on the drift rate; the exact rate will be determined by the ambient temperature and the type and quantity of oil spilled.

The shape and thickness of an oil slick will change under the influence of wind direction and velocity, wave action, time, and vessels passing through it. Table 2-3 is a graphic illustration of oil spill drift rates as a function of wind velocity. An average of 3.4% of the wind velocity is usually accepted as a reasonable working figure for planning oil movement on water. Studies indicate that wind driven waves can increase the speed of a spill by as much as 2.9% of the velocity of the wind driving the waves for a net increase in speed to approximately 5% of the wind velocity.

Actual observation of a crude oil spill indicates that oil will fractionate. The heavy components form patches as the slick elongates before the wind. The lighter fractions generally tend to evaporate. The rate of dispersion depends upon air and water temperature as well as the physical characteristics of the spilled material. In warm water, bacteria will often dissipate the entire spill in time.

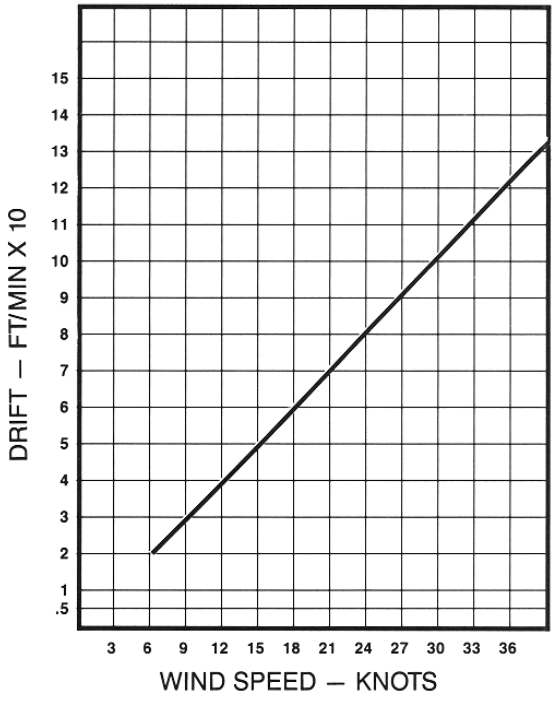

TABLE 2-3 OIL SPILL DRIFT RATES

BOOM RETRIEVAL

After the spill is officially declared "cleaned up" by the appropriate authorities, it is necessary to remove the oil boom from the site, clean it, and return it to its storage area. This is very important since its condition may make it unusable until it is cleaned and/or repaired.

Cleaning and inspection will also determine ownership of the boom. Ultra-Rapid Booms have identification plates, factory installed, on one end of each section of boom. At the time the boom shipment was opened, these identification plates should have been located and recorded for reference.

CLEANING AND MAINTENANCE

When cleaning the boom, make sure that the oily residue does not run back into a navigable waterway and create another pollution incident. Establish three suitable areas each slightly larger than a section or group of sections of boom, outline them with boards and cover each area with a plastic sheeting to form a tray. These are to be used for the soaking steps. The first tray should contain kerosene or an oil dispersant which will cut any heavy oil accumulations on the outside of the boom. A long bristled, stiff scrub brush can be used to help loosen the sludge.

The second tray should contain a mixture of water and an oil dispersant proven to be effective. This strong detergent solution will wash away any kerosene and accumulations of grime on the outside of the boom. Again, a stiff brush will help loosen any material that remains. DO NOT USE WIRE BRUSHES.

The third step utilizes clean water or ideally a power washer which uses hot water under high pressure. (Pay particular attention to edges of floats.) Any remaining detergent is rinsed away leaving a clean oil spill boom. Do not use steam. The boom should be allowed to dry before inspection and restowing.

Inspect the boom very carefully. Loose or missing parts should be replaced. Sections destroyed beyond repair should be removed and the boom spliced in the manner recommended by the manufacturer. When placing the boom in storage, do it carefully as you will want to launch it just as you did the first time without snagging or sustaining damage. Twists should be avoided. If you are removing the boom directly from the water, a small boat should be made available to help keep it away from the dock and to unhook it from any snags.