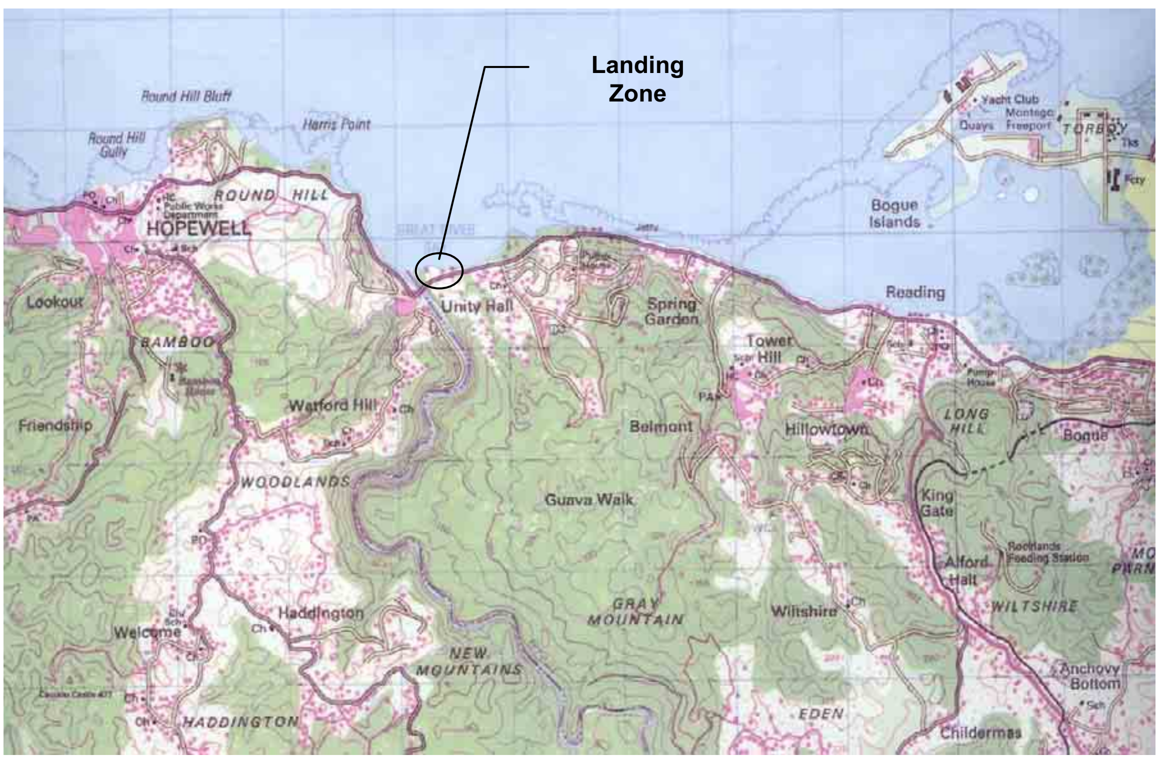
1.3.2.3 Montego Bay Site

Coordinates: Station - 18° 26.742'N – 077° 57.369'W

Landing Site - 18° 26.999'N – 077° 59.153'W

1.3.2.3.1Physical Description

The landing site proposed for the Montego Bay area is just east (within 200m) of the mouth of the Great River approximately 4.5 km to the west of Montego Bay on Highway A1. The landing site has been selected due to the fact that large pathways of silt and sand on coral reefs or sea grass beds are located around the mouth of the river which is most suitable for the laying of cable of this type. This is most likely due to the inflow of fresh water and sedimentation which occurs in the area.



<u>**FIGURE 1-14: MONTEGO BAY CABLE LANDING ZONE**</u>

FIGURE 1-15: SITE PICTURE FROM MONTEGO BAY CABLE LANDING POINT

At present, the proposed building location is in Reading within the property of the Chas O. Ramson Limited facility. The site is approximately 2.5 km west of Montego Bay and approximately 2 km east of the landing site at coordinates 18°26.742’N, 077°57.369’W. The site is approximately 5-6 meters above sea level, has 24 hour security and electricity is available within 50 m of the site. It is proposed that Fibralink will work with the relevant property owners and regulatory agencies to gain the necessary access and easements required to extend the cable from the landing site to the equipment building.

FIGURE 1-16: PROPOSED BUILDING LOCATION IN READING

1.3.3 Recommended Installation Techniques

1.3.3.1 General

This section details preliminary installation operations based on available information, experience and standard technology

1.3.3.2 Route Surveys

A marine route survey has been conducted. The main objective of the marine route survey along the projected cable routes was to develop sufficient bathymetric data to engineer and install the fibre optic cable.

Diver swim surveys have also been conducted in the shallow water sections. This was done in order to find an appropriate route; thereby avoiding any kind of obstacles and sensitive features such as coral reefs and sea grass areas.

Based on the information obtained from the Route Surveys, a suitable cable route has been selected. Illustrations of the inshore topography for the various selected route segments of the installation are illustrated in Figure 3-2, Figure 3-4, and Figure 3-6 and respectively.

1.3.3.3 Cable Installation

There are two separate operations required for cable installation, which are:

- Shore end operations
- Deep-water operations

The shore end activities are more site specific and are detailed based on the landing site. The redundancy of the system allows for two-switch-traffic, where the two separate cables coming into Jamaica are independent of each other so that the end user will not experience a disruption in their service should any one cable becomes damaged and taken out of service for repairs.

1.3.3.3.1 Laying Vessel

A cable ship or converted flatback vessel (offshore supply) will be used to install the cable. If using a flatback vessel, all the necessary equipment to manipulate the cable should be installed and tested prior to the start of the operations. The main necessary equipment is:

- Cable tank with an internal cone respecting the minimum radii of curvature of the cable.
- Caterpillar or linear cable engine (5 tons capacity).
- 20 feet container for splicing operations
- Small crane (3 tons capacity)

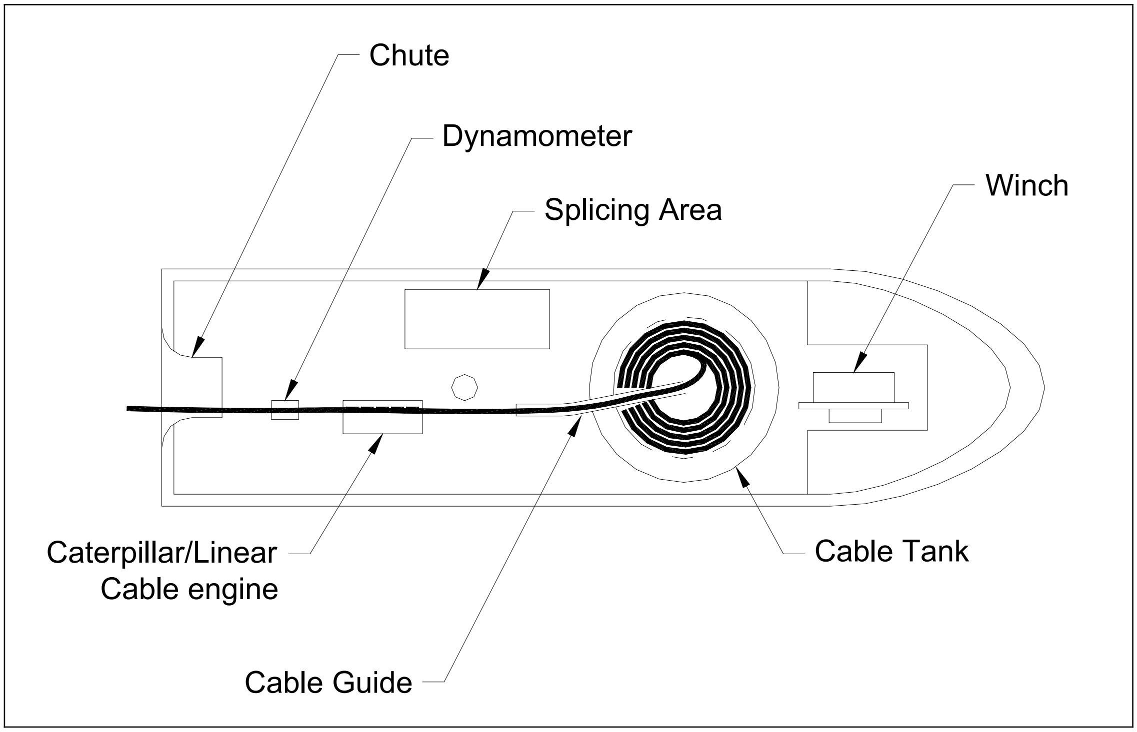


FIGURE 1-17: TYPICAL DECK LAYOUT

1.3.3.3.2 Shore End Operations

TABLE 1-2: TYPICAL SHORE END EQUIPMENT LIST

Equipment		Details
Support Vessel	Small Vessel such as a 16’ Zodiac equipped with an outboard motor for the shore crew and divers	
Shore vehicles	Line truck	Stand by vehicle to act as emergency backup or stopper
	Winch or winch vehicle	Min Capacity of 6 tons line pull
	Shore transportation (Car or Van)	
	Splicing van	
Special Equipment	2 x 18” diameter sheaves	To be set up in the manhole to guide and redirect the cable and maintain minimum bending radiuses
	Cable slider	
	5” snatch blocks (2)	
	2000’ of 1 1/8” diameter Uniline.	
	Cable guides	
	Shore power 5000 watt generator	
	Lights	
	Rotary impact drill or air tool with air supply	

Equipment		Details
	Hand tools (full set)	
	Barricades and safety tape	
	Traffic control and work area protection	

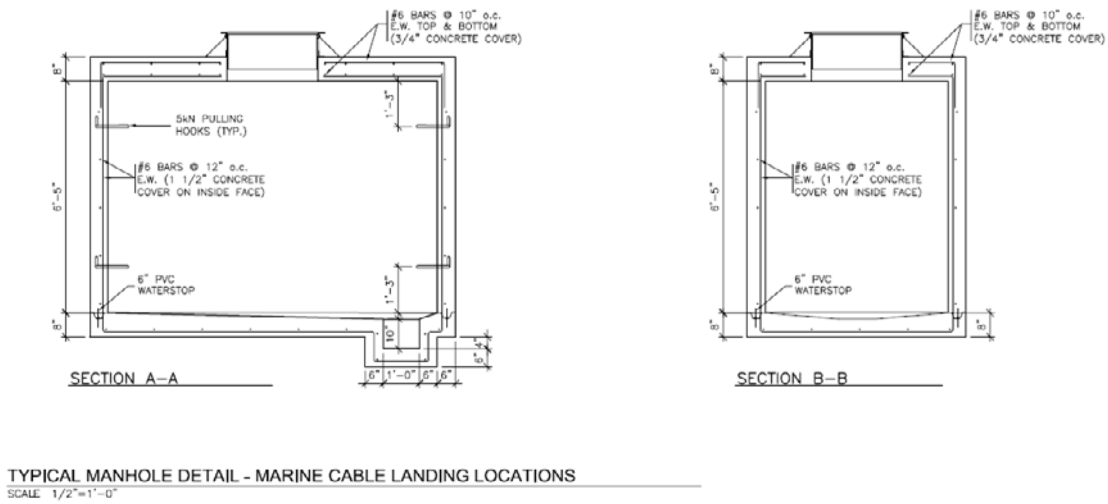
1.3.3.3.2.1 Procedure

The shore end superintendent will conduct a radio check prior to the start of cable pulling operations. The key personnel will be called and asked to respond individually -vessel aft deck, vessel bridge, winch operator and dive boat. The shore superintendent will then commence the shore end pulling operations.

FIGURE 1-18: ILLUSTRATION OF INSTALLATION FROM SHIP WITH A SHEAVE

The main lay vessel will be positioned near the seaward end of the directionally drilled pipe, in approximately 11 meters of water. The pull wire in the pipe will be retrieved by the diver and handed off to the dive boat who will in-turn pass the line to the ship. A 1⅛" uniline will be attached to the pull wire and pulled ashore using the winch stationed near the manhole (See Figure 1-19 and Figure 3-16). When the uniline is secured on shore, the ship will be advised. The deck crew will attach the cable to the uniline using a 6000lb Miller or similar swivel and a Yale cable grip. The deck crew will then advise the shore-end superintendent that pulling can proceed. The divers will follow the cable end to the pipe and ensure that the cable enters the pipe smoothly. The deck crew aboard ship will closely monitor payout tensions and draw speed as the cable is pulled into the manhole.

FIGURE 1-19: ILLUSTRATION OF INSTALLATION WITH A WINCH ON THE SHORE; BUOYED CABLE ON THE RIGHT



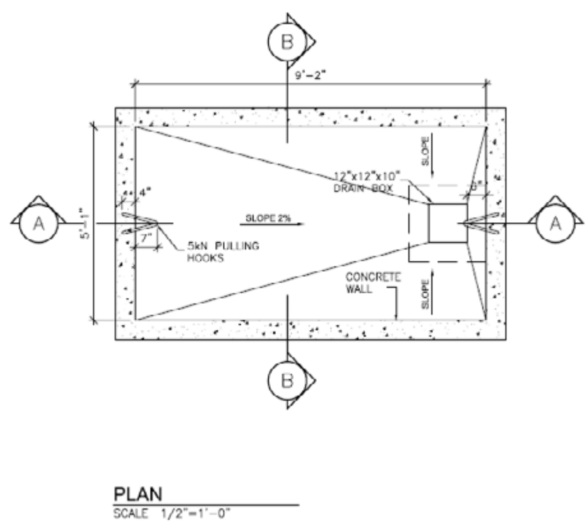
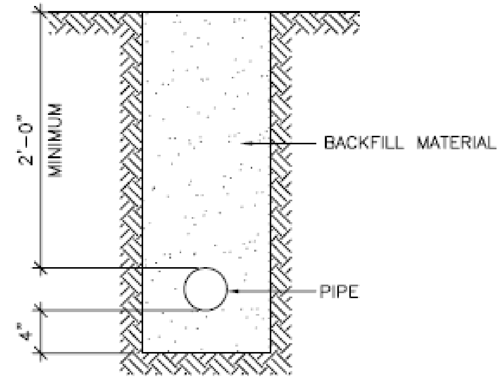
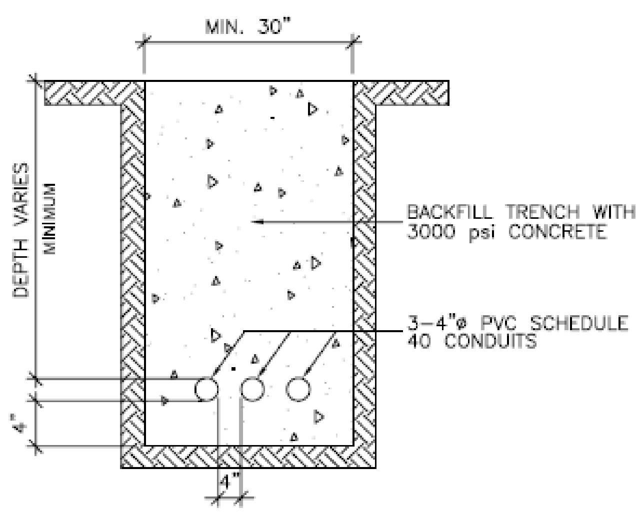


FIGURE 1-20: MANHOLE PLAN DETAILS



TYP. TRENCH DETAIL IN ROAD SHOULDER
SCALE 1"=1'-0"

FIGURE 1-21: TYPICAL TRENCH DETAIL IN ROAD SHOULDER



TYP. TRENCH DETAIL AT SHORELINE
SCALE 1"=1'-0"

FIGURE 1-22: TYPICAL TRENCH DETAIL AT SHORELINE

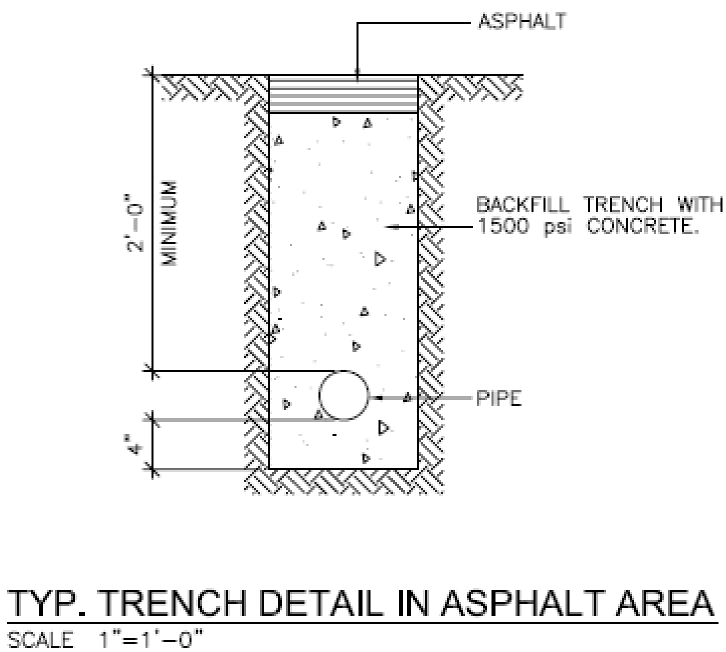


FIGURE 1-23: TYPICAL TRENCH DETAIL IN ASPHALT AREA

When the cable reaches the shore and sufficient cable slack has been brought ashore the cable will be stoppered off to the line vehicle. The ship will make ready to start laying cable and move off at a speed of approximately 1.0 knots. Cable will be surface laid throughout the route.

FIGURE 1-24: ILLUSTRATION OF INSTALLATION USING A LANDING CRAFT

In order to reduce the potential impact to hard-bottom substrate, the route has been designed to avoid crossing high-relief outcrops.

After the ship has laid the cable, the divers will swim the length of the cable from the end of the duct to a water depth of 85 ft to ensure that the cable is lying on the bottom and no suspensions exist. Any minor suspensions will be removed by hand. If the divers discover more severe suspensions the cable ship will evaluate recovering the cable, clear the suspension and re-lay the cable. Once divers have confirmed that the cable is satisfactorily positioned, the ship will resume laying. When approximately 2.5 km of cable have been laid, the stopper will be released on shore. The manhole clamp will be installed on the cable.

1.3.3.3.2.2 Splicing Operations

Splicing operations will start as soon as the clamp has been installed on the cable. The splicing will take place in a climate controlled environment vehicle. Upon completion of the manhole splice the cable will be tested bi-directionally using set-ups at the cable station and aboard ship. Satisfactory results will allow the splicers to permanently close the manhole joint.

1.3.3.3.3 Deep Water Operations

1.3.3.3.3.1 Laying Specifications

After receiving confirmation that cable is securely anchored, the vessel starts to move seaward.

Care must be exercised over the slack control as the vessel moves away from the shore end landing position to avoid pulling the cable and inducing suspensions.

The cable is surface laid throughout the whole lay. Cable is paid out from the linear cable engine as the vessel advances along the planned cable route.

Throughout lay operations, the cable tension will be monitored and adjusted as necessary to maintain the design level installation slack in the cable. The vessel shall move in a straight path from its position during landing operations to the first alter course. Movement between this alter course position and subsequent alter courses must also be a straight path.

The ship stops at the next site shore end position and starts shore end landing operations as described in corresponding shore end section.

1.3.3.3.3.2 Final Splice Optional Laying Scenario

In case of bad weather or unforeseen events, a direct lay as described in the previous section might not be possible. A 2-segment lay with a final splice would then be necessary.

1.3.3.3.3.3 First lay

After receiving confirmation that cable is securely anchored, the Master of the laying vessel instructs the tug (if used) to release the mooring lines. The vessel then starts to move seaward. Care must be exercised over the slack control as the vessel moves away from the shore end landing position to avoid pulling the cable and inducing suspensions.

The cable is surface laid throughout the whole lay.

Cable is paid out from the linear cable engine as the vessel advances along the planned cable route. Throughout lay operations, cable tension measured at the stern dynamometer is maintained in strict accordance with the provided tension tables. The vessel shall move in a straight path from its position during landing operations to the first alter course. Movement between this alter course position and subsequent alter courses must also be a straight path.

Lay operations then continue on the planned route. At the end of the lay i.e. at the final splice location, fifty (50) meters of line are streamed along the cable route and a temporary anchor (250 lbs. concrete clump) placed. The end of the Uniline is then buoyed off.

1.3.3.3.3.4 Cable Recovery

While proceeding to the buoy position, all required deck equipment, (i.e., hack lines, recovery line, lashing & stoppers) is staged as required.

Cable splicing equipment are broken out and tested prior to recovery of the cable.

Cable end buoy is recovered.

When the Uniline begins to take a lead to the cable end, the vessel begins moving to the cable end as the rope is recovered.

The vessel proceeds in this manner until a sufficient amount of the laid cable is onboard to perform the splice.

1.3.3.3.4 Final Splice

End of both cables is fed into the splicing area.

Splicing personnel proceed with the final splice.

The fibers are terminated and tested.

When the final splice is completed and the tests show no fault, the cable is out board. The system should be tested when touching the seabed, before cutting the lowering line.

1.3.4 Cable Repair Techniques

1.3.4.1 General

The following section briefly touches on cable maintenance and repair. All submarine cables are susceptible to failure from external sources, such as fishing activity and anchor mauls. The following table gives the percentage of failure causes for 380 reported cable faults. Careful planning and implementation can greatly reduce the risk of such failures. Initial prevention will result in a highly reliable telecommunications facility.

Table 1-3: Percentage of Failure Causes for 380 Reported Cable Faults

Cause	Count	%
Abrasion	18	4.7%
Anchor	49	12.9%
Branching Unit	2	0.5%
Cable or Survey Ship Activity	5	1.3%
Dredging/Drilling and Pipe Installation	12	3.2%
Earthquake or Seabed Movement	10	2.6%
Equaliser	1	0.3%
Fatigue	1	0.3%
Fishing Activity	184	48.4%
Impact by Hard Object	5	1.3%
Insulation Failure	3	0.8%
Jointing Box	5	1.3%

Cause	Count	%
Manufacturing Defect - Cable	4	1.1%
Repeater	17	4.5%
Unknown - Cable Deliberately Cut	1	0.3%
Unknown - Cable Mauled	6	1.6%
Unknown - Cable not repaired	1	0.3%
Unknown - Fibre Attenuation	5	1.3%
Unknown - Kinks, Twists, Loops	9	2.4%
Unknown - Shunt Fault	31	8.2%
Unknown - Tension Break	11	2.9%
TOTAL	**380**	

1.3.4.2 Canvassing Offshore Industries

Fibralink will make strong representations to the governments to have the cable route declared a prohibited anchorage.

If bottom fishing abounds in the vicinity of the route, it will be appropriate to establish a program of liaison and dialogue with the industry. Hydrographic charts could be personalized to highlight the route and carry suitable warnings and be distributed free with other promotional items.

1.3.4.3 Repair Methodology

When a cable system is interrupted, tests are made from terminals or suitable access points ashore to localize the trouble to an accurate geographical position, as derived from laying records. This localization will dictate the repair method to be selected, as follows:

1.3.4.3.1 In Diver-Depths

When the interruption is close inshore (preferably less than 20 meters), a barge can be mobilized and moored over the site. Diving inspection or an electronic probe will locate the damaged area.

In the case of an electronic probe, a low frequency tone (e.g. 25 Hz) is injected on the center conductor from the terminal. The probe in its various forms is deployed close to the cable. This will detect either the electromagnetic or electrostatic field developed along the cable. The range of the signal decreases with the length from the terminal but should cause no problems in this case. Probes can be a diver hand held device or attached to a two conductor cable towed from a surface vessel (towed electroding).

This technique permits accurate location of the cable and further, will usually indicate the fault location by registering a significant change in signal field strength at that point.

The ends will be hauled (or floated) to the surface and secured at the barge. After suitable electrical/optical tests have confirmed no other interruptions are present, a new spare piece is jointed/spliced in and the bight lowered, under controlled conditions, to the seabed. If appropriate the exposed cable will be diver-jetted into the seabed.

1.3.4.3.2 Conventional Method in Deep Water

The assigned repair vessel travels to the location and, if appropriate, establishes the precise position of the interruption by means of electroding. The vessel then using a special detrenching grapnel, grapples across the cable and raises it to the surface. The bight of cable is hauled inboard on the grapnel and secured. After cutting the bight, the ends are opened and tested. In the ideal case testing in one direction will establish its mechanical/transmission integrity while testing in the other direction will indicate the break to be close to the ship.

After sealing and buoying off the good end, the short stray end is recovered to a spare storage tank or coil space and the ship proceeds to grapple for the end on the far side of the break. She raises the bight of cable, boards it, cuts the bight and tests. If everything is satisfactory she then splices on replacement cable, from a storage tank or coil on board, to the good end and pays this down to the seabed while steaming towards the buoyed end.

When the cable buoy has been recovered and the first good end tested and confirmed to be still OK the payout is terminated and the replacement cable is cut on the foredeck. Its end is joined to the recovered end and a final splice is made, whereupon the bight of cable is lowered to the seabed. After appropriate transmission tests have been made, the system can be returned to traffic.

Mobilization would comprise loading the replacement cable, gathering such customer specialists and equipment as are required and proceeding to site.

The first alternative to a dedicated cable ship as above would be to engage an offshore flatback on spot-charter, if available, and spend some days fitting out and mobilizing as above for the repair. Then proceeding to site.

1.3.4.4 Spare Cable and Repair Facilities

Spare cable and repair plant will be located as close to the cable route as possible, or at the base of the dedicated cable ship or ship of opportunity. Spare cable will be stored in a sheltered, temperature-controlled environment and be readily available for loading to ship at a deep-water berth.