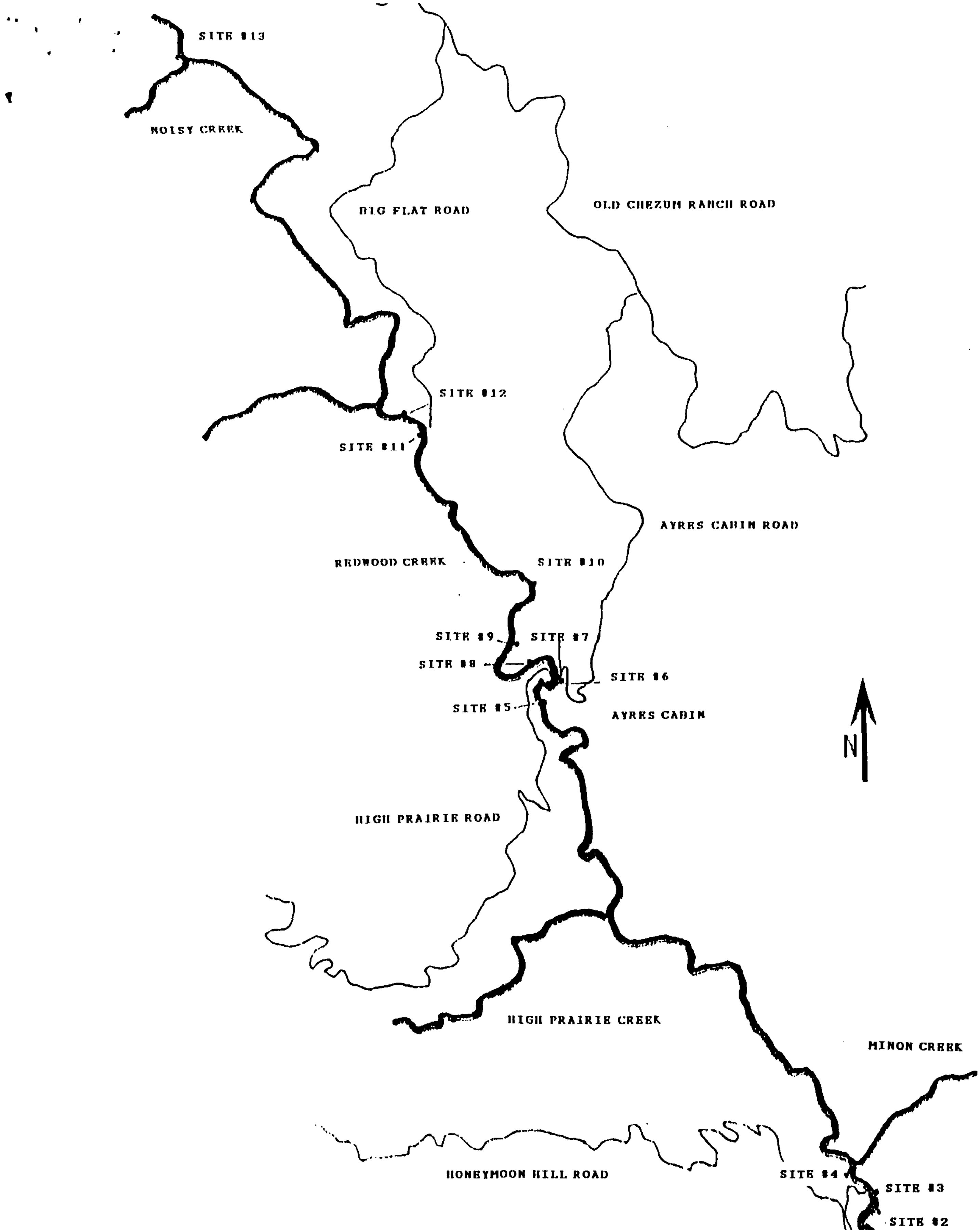
REDWOOD CREEK POOL SHELTERS

FINAL REPORT

FG-8451

1989-1990

TRINITY FISHERIES CONSULTING
PO BOX 820
ARCATA, CA.95521


SITE #13
NOISY CREEK
BIG FLAT ROAD
OLD CHEZUM RANCH ROAD
SITE #12
SITE #11
AYRES CABIN ROAD
REDWOOD CREEK
SITE #10
SITE #9
SITE #7
SITE #8
SITE #6
SITE #5
AYRES CABIN
N
HIGH PRAIRIE ROAD
HIGH PRAIRIE CREEK
MINON CREEK
HONEYMOON HILL ROAD
SITE #4
SITE #3
SITE #2
LAKE PRAIRIE CREEK
SITE #1

BACKGROUND

Contractor:	Trinity Fisheries Consulting
Contract Representative:	Matt Smith
Agreement Number:	FG-8451
Budget Amount:	$31,416.00
Budget Spent:	$31,416.00
Budget Remaining:	$0.00
Project location:	Main channel Redwood Creek from Honeymoon Hill Road at upstream to Noisey Creek at downstream.
Land Ownership:	Simpson Timber Company, Joe Massei Ken Bareilles

Land Owner Participation: Simpson Timber Company-
Allowed access across their property (provided keys).
Joe Massei-
Allowed access across his property, Provided lodging, Donated heavy equipment and operator time (16 hours), Donated trees and rootwads
Ken Barreilles-
Allowed access across his property

WORK PERFORMED

An extensive inventory was performed to determine which pools were lacking cover the most. Out of fifty pools twenty were targeted for pool shelters. Boulders, logs, and rootwads were yarded into these pools devoid of rearing and escape cover. One pool had three boulders placed in it to provide cover. Twelve other pools had multiple logs or rootwads placed in them. The project took two seasons to complete. Thirteen sites were completed during the first years work. Unusually flashy high flows during the winter of 1989-90 displaced site thirteen and site eleven lost two of the eight logs that were present. Other sites had some cables fail due to poor rock composition (cables broke rock and pulled out) resulting in loose logs on the structures. Most of the 1990 season was spent repairing and adding cables to the previosly constructed structures. Much of this work was required due to the poor quality of the bedrock present. Extra cables with extra deep holes were added to insure structure longevity. Logs were also added to four of the structures to increase their complexity. Site thirteen was relocated downstream at the mouth of Noisy Creek where pool orientation made the structure less vulnerable to displacement in high flows.

The following is a listing of what type of structure was developed at each site. The location of each site is shown on the project area map. See pictures #1 & #2 for examples of the structures.

Structure Types

Site #1	Three boulders cabled together on bottom of pool.
Site #2	One large fir log in a digger configuration, two smaller logs forming a spider on the right bank.
Site #3	One large fir log and rootwad are cabled to boulders mid channel.
Site #4	Six large fir logs, two with rootwads, forming a spider in a digger configuration on the left bank.
Site #5	Five large fir logs, two with rootwads forming a spider on the right bank.
Site #6	Four logs ,one with a large rootwad forming a spider on the left bank.
Site #7	Two oak logs, one with a rootwad cabled to bedrock on the right bank.
Site #8	Seven fir and oak logs, two with rootwads forming a spider on the left bank.
Site #9	Three logs forming a spider with a digger configuration spanning from the center of the channel to the right bank.
Site #10	One large fir log with rootwad and one oak log with rootwad forming a spider on right bank.
Site #11	Eleven fir logs, one with a large rootwad forming a spider in a digger configuration on the left bank.
Site #12	Ten logs, two with rootwads forming a spider on the right bank.
Site #13	Six large fir logs cabled together in a digger configuration on the left bank.

BENEFIT

Species benefitted are steelhead trout and chinnok salmon. Steelhead trout juveniles utilize the pool shelters during the summer months for escape cover. Adult chinook salmon use the shelters during winter for escape and velocity cover. The shelters act as filter nets, providing a benefit by supporting food organisms. After the winter of 1989-90 increased depth in some pools was noticed. This increase resulted from the hydraulic influences created by the woody debris structures which were placed in them.

All of the work was covered by the original budget amount requiring no add-on of additional funds. The original proposal called for thirty sites to be developed. The budget allowed for structures having one to two logs. It was deemed appropriate by the habitat supervisor to construct structures with more complexity. The average number of logs per structure was five, and some structures had as many as eleven logs. Sixty-one logs and three boulders were used for the thirteen sites compared to sixty logs with thirty sites originally called for. Considerably more cable, clamps, and Hilti glue was used to construct the more complex structures. The cost/benefit ratio is essentially the same for the original proposal and the completed work. TFC feels the final sites with increased complexity provide greater carrying capacity even though less pools were targeted. This assumption is from the reasoning that more surface area in spider structures compared to single or double log structures will provide more micro habitat niches, supporting more fish. Single or double log stuctures usually provide holding area on two sides of the structure. Spider structures provide holding area in multiple areas. If this reasoning is true, the cost/benefit ratio would be greater than the original proposal.

TIME FRAME

Construction was performed during the summer field seasons of 1989 and 1990. In 1989 work started early August after receiving a notice to proceed from the department on July 5th. Work was discontinued in mid October when an unusually high discharge storm raised water levels. The 1990 construction began July 18th, and was completed July 31st. Sixteen hundred person hours including administrative time, were needed to complete the job.

EVALUATION

Follow-up work is recommended but not required. The cable used for anchoring can stretch after use which can loosen the cable clamps. The clamps could be tightened after one year to reduce the possibility of structure failure. Where cable wraps around a log, abrasion occurs, resulting in the cable loosening. Cable that loosens due to this, could be cinched tight and re-clamped.

TFC volunteered limited pre-project monitoring before the structures were developed. Direct observation diving was performed on several pools to determine species composition and abundance. Habitat dimensions were also recorded. Important follow-up work could involve performing post-project monitoring to compare data before and after the structures were developed. Visual observations directly after constructing pool shelters showed there was an increase number of rearing juvenile steelhead trout compared to before the structure placement.

TECHNICAL INFORMATION

TFC has seven years habitat enhancement construction experience. Many unique techniques have been developed during that time. A few techniques which were used on this project are described in detail.

Cabling

Large diameter steel cable is extremely stiff which resists bending. This can cause problems in creating tight enough anchor points. If cable is wrapped by hand around two logs and clamped together the cable will have slack. Slack creates flexibility at an anchor point, allowing the logs to twist and move. When this happens the cable can become frayed. Also, the cable can cut into the log creating additional slack, ultimately resulting in structure failure. To prevent this from happening the cable must be cinched tight. We have retrofitted standard cable clamps, welding hooks onto them (see picture #3) to provide a means of hooking a come-a-long to the cable ends. Clamps are attached to different places on the cable depending on the way in which the cable is wrapped. A come-a-long with it's yarding cable extended is hooked to one cable hook, wrapped around the logs and then hooked to the second cable hook. The come-a-long is then ratcheted in, tightening the cable. Before the cable is all the way tight two cable clamps can be put around the two cables where they are to be anchored. Leave the clamps loose so the cable can pull through them. Cinch the cable tight the rest of the way and then tighten down the cable clamps securing the anchor point.

The come-a-long can now be released and the cable will stay tight.

Drilling

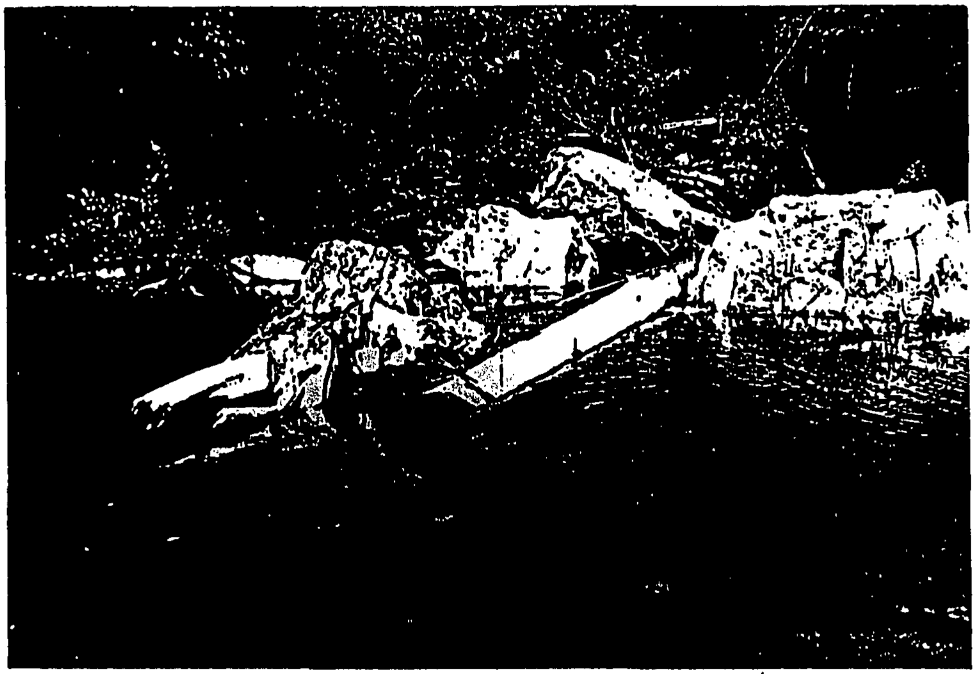
When cable is wrapped around a log and clamped off to secure it, if the cable is not run through a drilled hole first, the cable will work itself loose. Cable is flexible allowing logs to twist and move. This twisting movement abrades the log, creating slack which eventually allows the log to slip out of the cable loop. A hole must be drilled through the middle of the log where the cable is to be wrapped around it. The cable is run through the hole and then wrapped around the log which prevents the log from twisting (see illustration #4). Even if the log becomes abraded and loose, it will not be allowed to slip out of the cable loop. Twisting of the logs must be prevented as this can cause the greatest amount of abrasion. This can be achieved by clamping the cable on either side of the log where the cable enteers the drilled hole. By clamping the cable in this fashion the log is prevented from twisting, because the cable clamps keep the cable from pulling through the drilled hole. In some situations two holes are drilled into bedrock on either side of log to secure it. The cable runs from one hole in the rock around the log, through a drilled hole and back to the second hole in the rock. If one of the rock holes fails then the cable is allowed to pull through the log. To prevent this, cable clamps must be placed on either side of the log so if one rock hole fails then the opposite clamp will still keep the log secure.

Holes drilled into bedrock or boulders must be located as close to the structures anchor point as possible. The shorter the cable length the less slack there will be to allow movement of the structure. The more the structure is allowed to move, the more abrasion will occur, lessening the structures life.

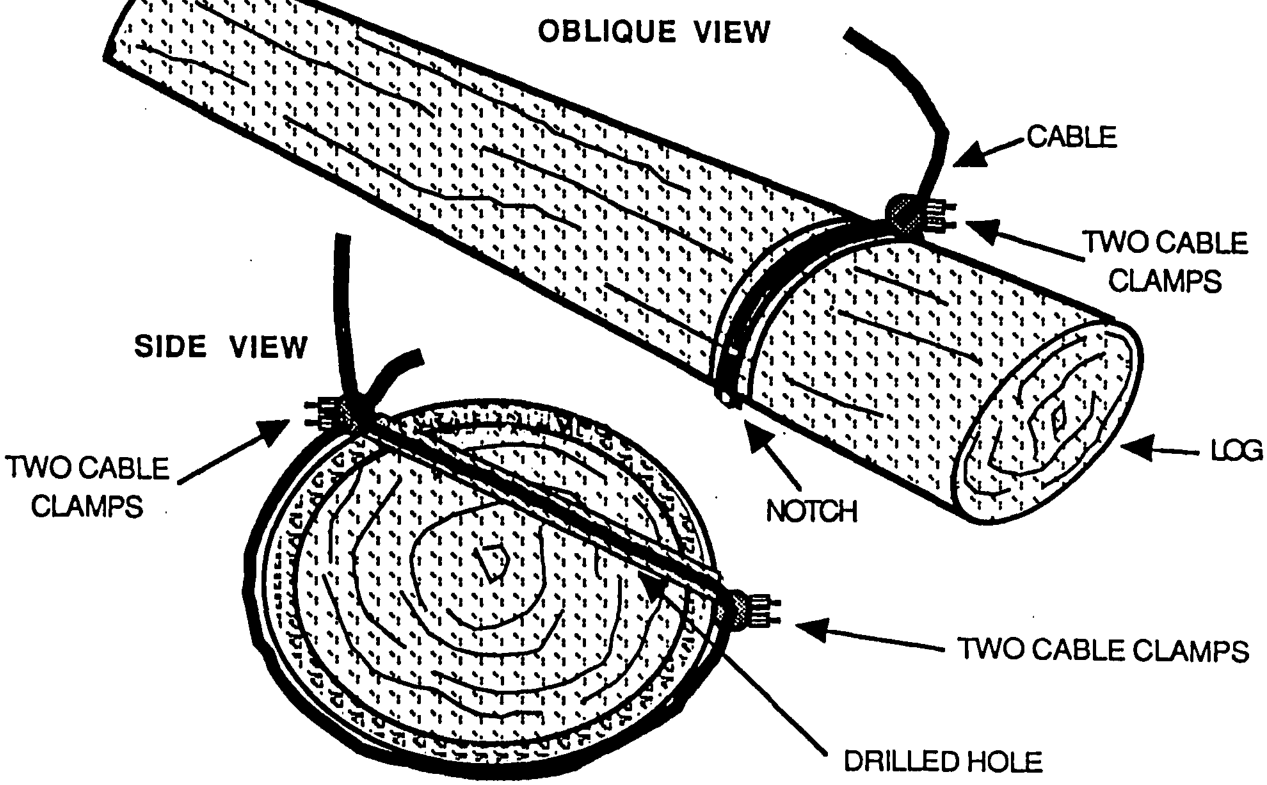
The Hilti anchoring system must be applied properly to insure there is no failure of the Anchor point. The type of rock to be drilled determines the depth the holes to be drilled. Hard non fractured rock can have eight inch holes, and softer fractured rock must have twelve to fourteen inch holes. Hilti adhesive is expensive making it more cost effective to drill a second hole if the first hole becomes fractured when drilling. When cleaning the hole with water, if the water empties out of the hole into the fractured rock then the Hilti adhesive will also do the same. If the Hilti adhesive is allowed to fill these fractures, then it can not be forced back out of the hole around the cable. This results in insufficient bonding between the cable and rock. Cleaning the hole properly after drilling is very important for bonding strength. If any rock dust is left on the sides of the hole the Hilti adhesive will bond to the dust and not to the rock. Use a wire bottle brush and a squeezable water container with a long extension hose on it to clean the holes. Alternate flushing the hole with the water bottle and brushing the hole out with the brush. This must be down a minimum of six times. The water bottle extension hose is important as this pushes the rock dust up from the bottom of the hole when it is inserted to the bottom of the hole.

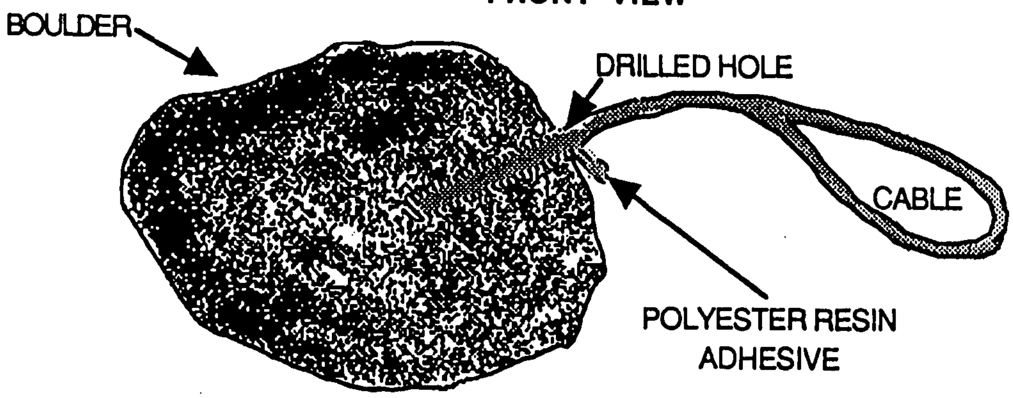
Yarding

There are many yarding systems currently used for moving materials used in habitat enhancement structures. Griphoists, come-a-longs,and chainsaw winches are some of them. TFC has been using a new yarding system for two years with good results. This system is the Rhino



CABLING


OBLIQUE VIEW
CABLE
TWO CABLE CLAMPS
SIDE VIEW
TWO CABLE CLAMPS
LOG
NOTCH
TWO CABLE CLAMPS
DRILLED HOLE


FRONT VIEW
BOULDER
DRILLED HOLE
CABLE
POLYESTER RESIN ADHESIVE