CFCC HANDLING MANUAL

FOR

KITTERY OVERPASS BRIDGE

BRIDGE NO. 3860

WIN 19283.00

Jan 7, 2014

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CFCC Handling Manual for Kittery Overpass Bridge

CONTENTS

1. Scope

This manual describes how to properly handle CFCC products for the Kittery Overpass Bridge.

Namely, this manual describes, in comparison with such products of steel, there are some particular cautions to be applied to handling of CFCC products, in addition to some of general cautions for handling steel products.

In addition to observance of matters described in the manual, appropriate care should be taken to avoid damages or cause of adverse effects on CFCC.

2. Important features of CFCC (in Handling)

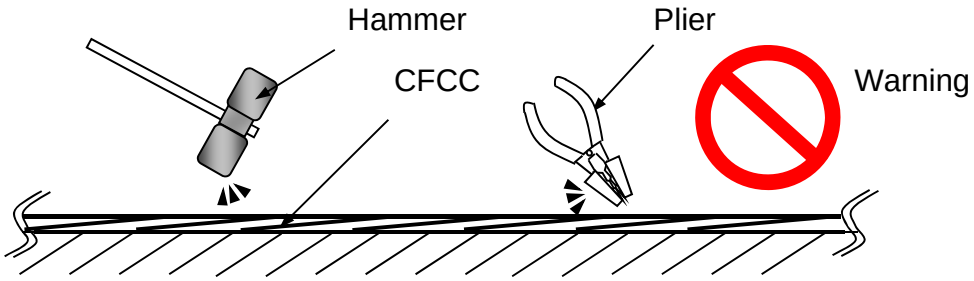
CFCC has the following features:

- Basically, CFCC is made of a bundle of 7μm carbon fibers solidified with epoxy resin.
- Light and highly resistant to tensile force in the axial direction
- CFCC is easy to coil in comparison with steel cables of the same diameter and structure.
- CFCC is vulnerable to compressive force in the axial direction and force applied at right angles to the axis. There is a risk of damage when a hard object hits against CFCC or a heavy object is mounted. CFCC will break if curved with a small curvature. The strength against the shearing force is approx. half of that of steel bars.
- Since CFCC is solidified with epoxy resin, it can be chipped with an object with a hard edge.
- Since CFCC is solidified with epoxy resin, it is vulnerable to fire, and the quality of resin will change and the strength will be lowered when contacted with extreme heat, such as welding sparks, flame, cigarette fire, etc.
- The strength will be lowered when the CFCC are untwisted. Therefore, take extra care not to untwist the cable when tensioning the CFCC.

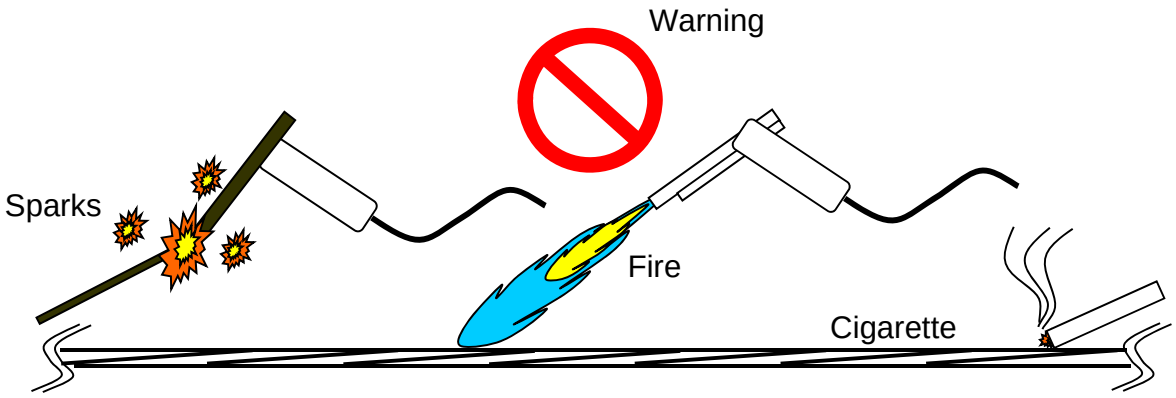
3. Prohibited matters and precautions for handling

(1) Prohibited matters

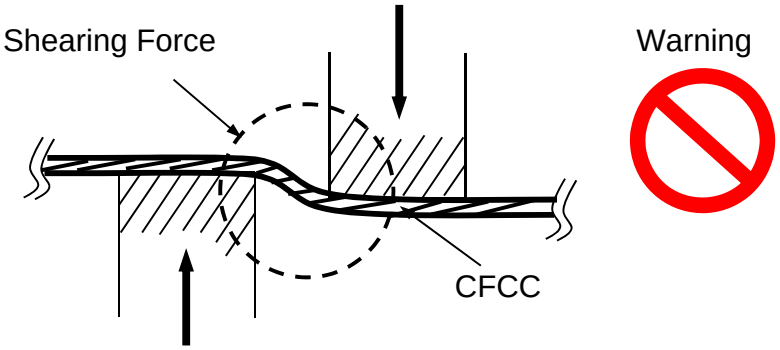
1) Falling object (tools and other hard objects)



2) Fire/heat (contact with hot objects)

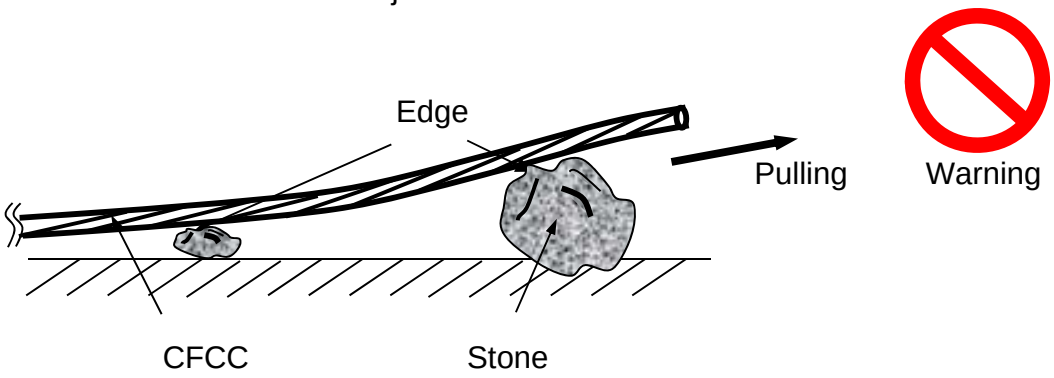


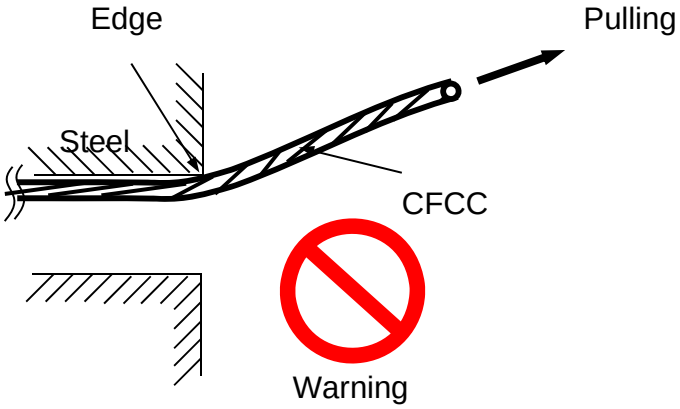
3) Shearing



4) Chipping

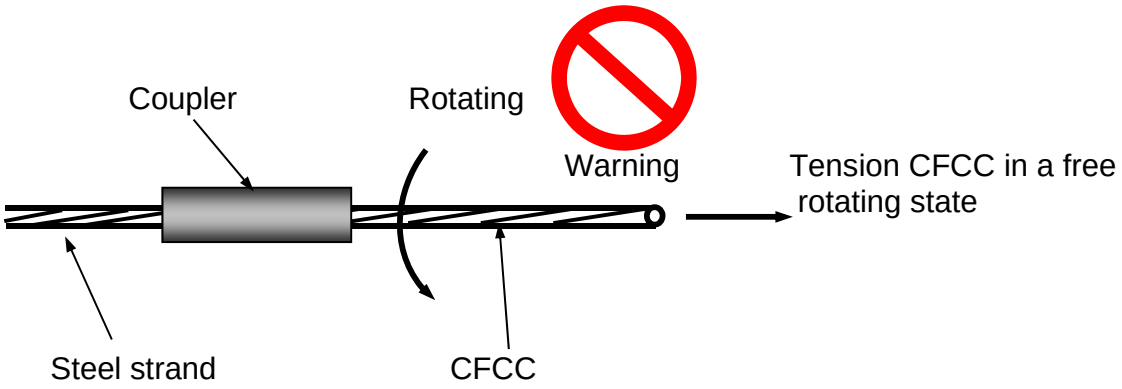
Friction with hard objects





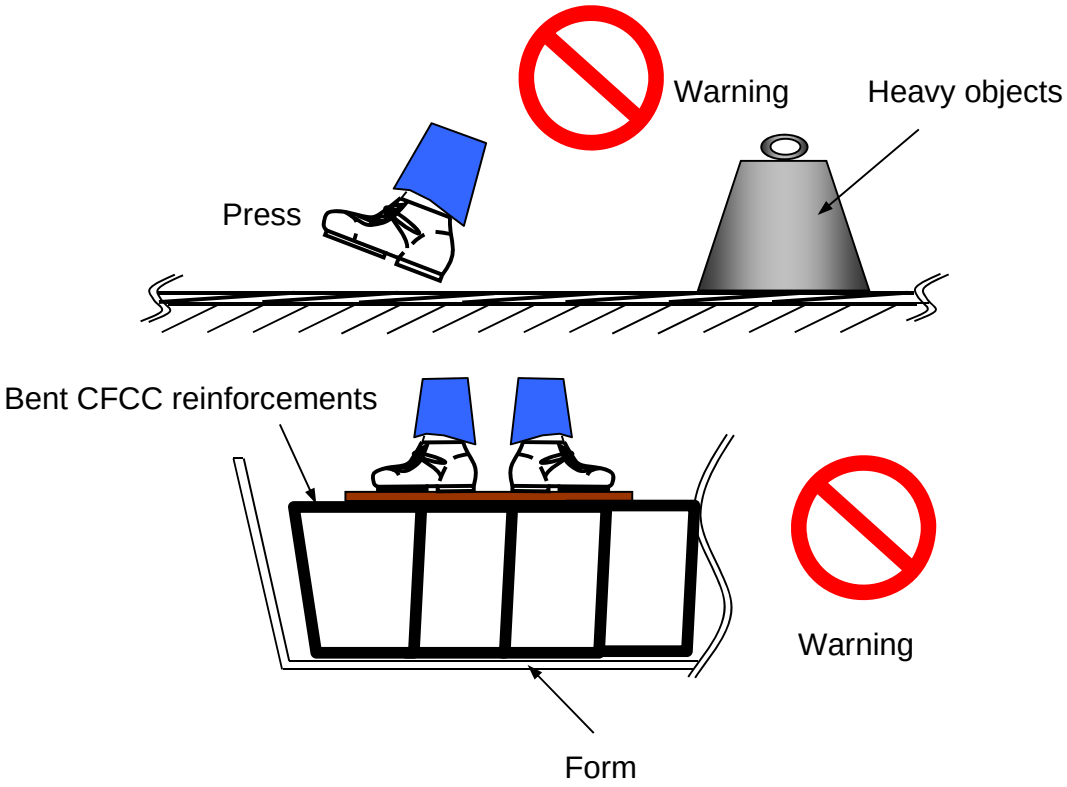
5) Untwisting

Tension CFCC in a free rotating state.

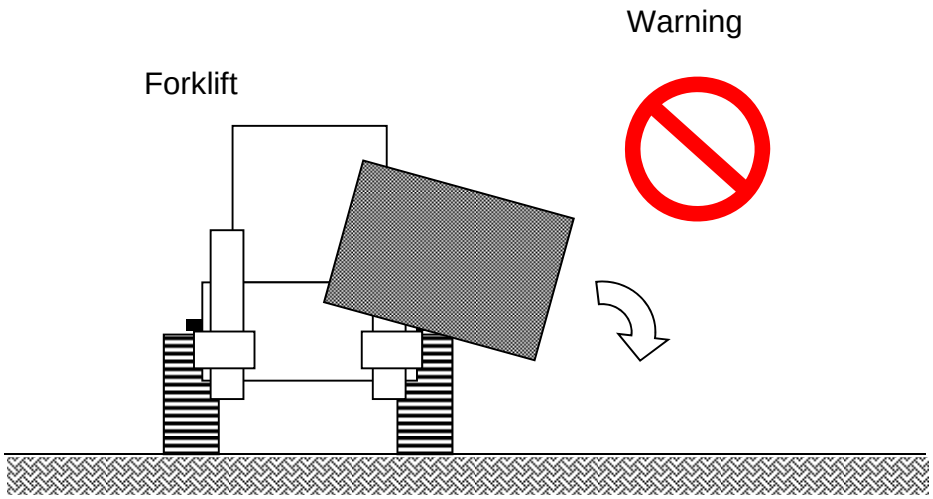


6) Stamping and loading heavy objects

Workers shall not step on fabricated CFCC reinforcements.



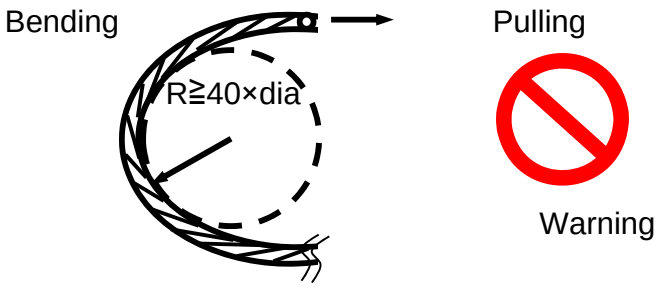
7) Dropping the package of CFCC products



(2) Precautions

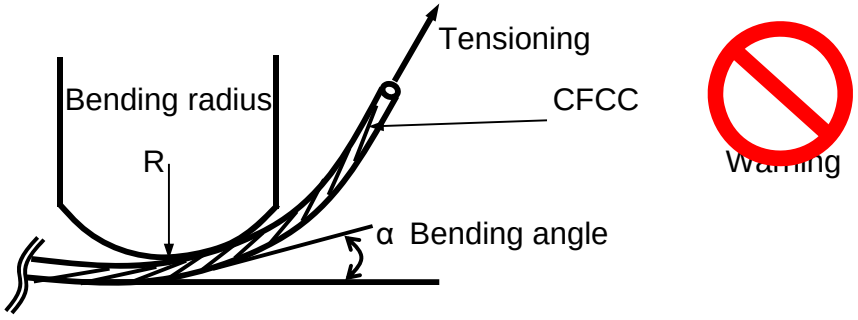
1) Bending without tension

When bending CFCC , bend it with as large a bending radius as possible.



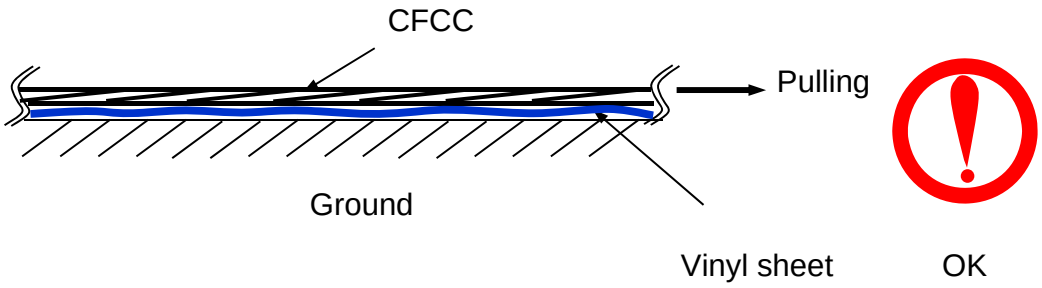
2) Bending with tension

When tensioning CFCC while it is bent, strictly observe the bending radius (R) and bending angle (α).



3) Dragging

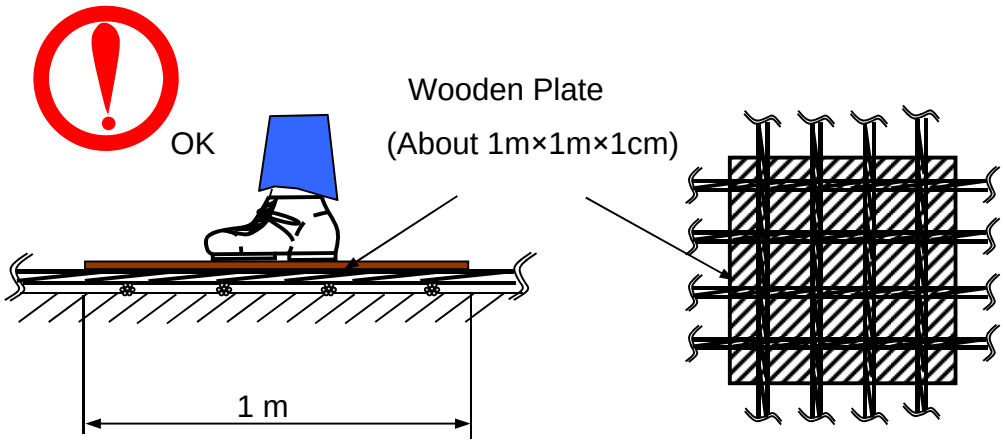
Before uncoiling and dragging CFCC, spread a safe sheet (vinyl sheet) underneath to avoid scratches and stains on CFCC.



4) When stamping CFCC is unavoidable during work

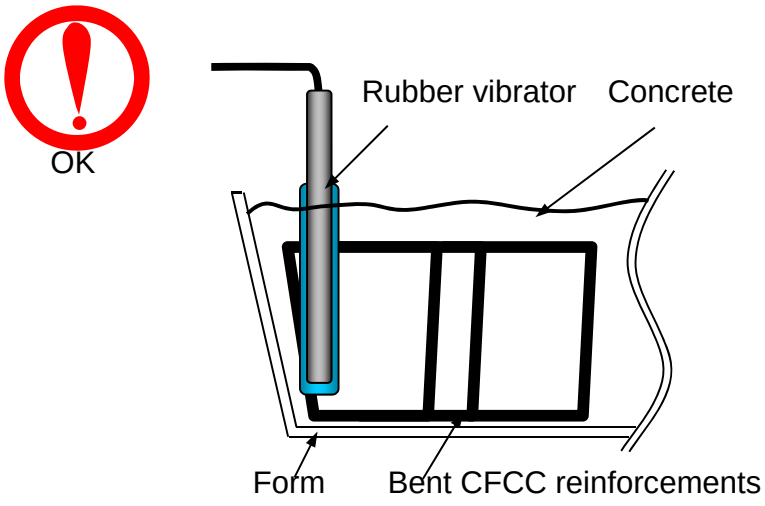
Alleviate the force applied to the portion where CFCC is piled up. For example, the force should be less than 10 kg per portion.

When stepping on the fabricated grid CFCC reinforcements shown in the figure, place a 1 m^2 or larger wooden plate and step on the plate.



5) Vibrating

Concrete in the form shall be vibrated using rubber or vinyl tipped pencil vibrators only. Vibrating the form externally is allowed.



(3) Others

If any nonconformance is found in a product, do not use it as it is.

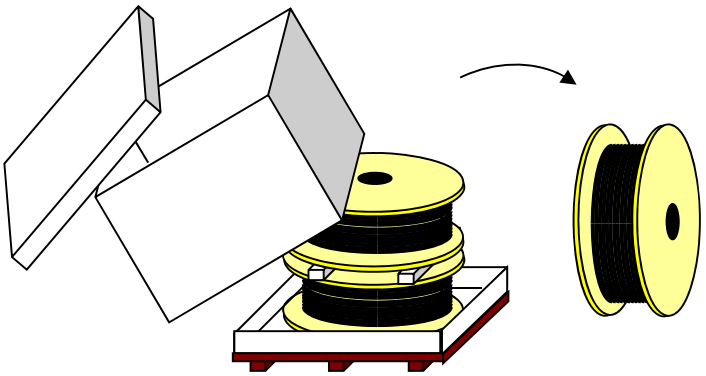
4. Unpacking and uncoiling of straight CFCC reinforcements

4.1 Unpacking method of straight CFCC reinforcements

Procedures

See figures.

1) Remove the cap of a cardboard box.
2) Using the slings and crane, pick up the wooden reel on which the cables are wound

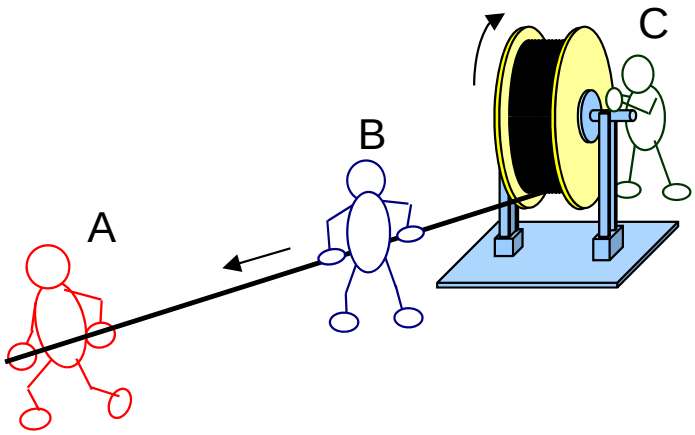


4.2 Uncoiling method of straight CFCC reinforcements

Procedures

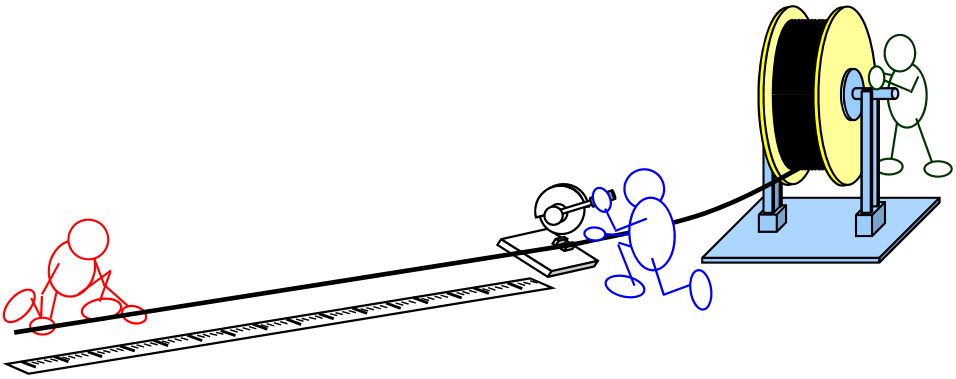
See the figures.

1) Put the wooden reel on the reel stand.
2) Pull out the cable slowly from bottom of the wooden reel.



3) Measure and mark off the portion of the cable and to be cut to a certain length by white marker pen.

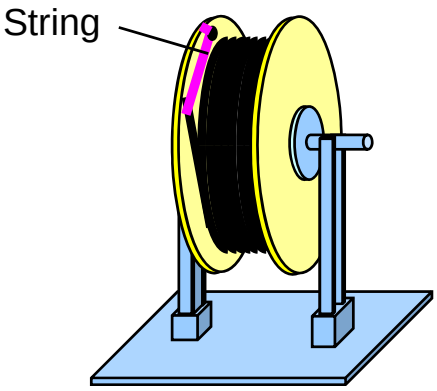
4) Using the grinder cutter, cut the portion on the cable.



Notices

Hold outside the reel during the spreading work, because it is the property to suddenly unwind.

Fasten the end of CFCC to a wooden reel with a string,
at the time of the work end or the work intermission.



5. Handling of straight CFCC bars and bent CFCC reinforsements

5.1 Precautions for work as a whole

General precautions for handling straight CFCC bars and bent CFCC reinforcements are explained here.

There will be absolutely no field bending of the bars and the bent shapes allowed. The bent shapes are pre-bent to approved shape.

5.2 Method for tying CFCC reinforcements

(1) Tying material

Straight CFCC bars and bent CFCC reiforcements shall be tied with clipped plastic cable ties. See the photo.

(2) Tying method

Straight CFCC bars and bent CFCC reiforcements shall be tied so that they will not move out of alignment during or after concrete is placed. Intersecting bars and bent reinforcements shall be tied at each intersection.

6. Setting anchoring device and tensioning device for pre-tensioning

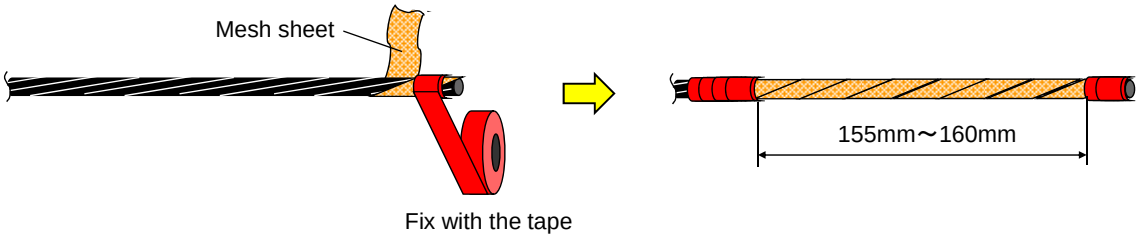
6.1 Method of setting anchoring device

(1) Wrapping the buffer material

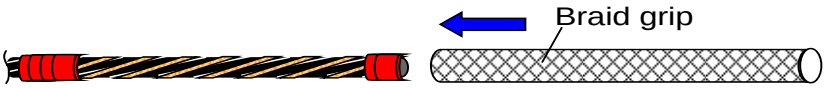
Procedures

See the figures.

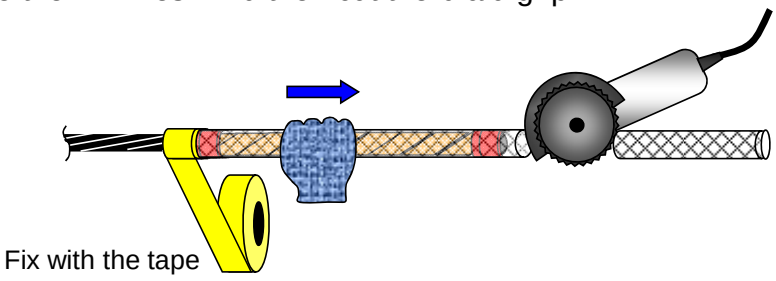
1) Wrap the anchoring part of CFCC with the mesh sheets.



2) Insert CFCC into the braid grip, and cover the mesh sheet with the braid grip.



3) Draw the braid grip tightly in the direction of the arrow through your hand in order to eliminate the wrinkles. And then cut the braid grip.



Notices

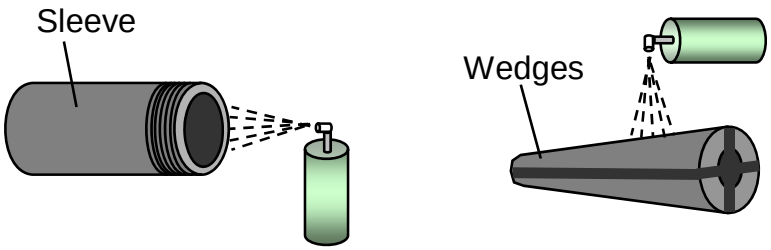
Wear gloves at the time of the work, because tip of the wire sticks.

(2) Setting wedges and sleeve to CFCC

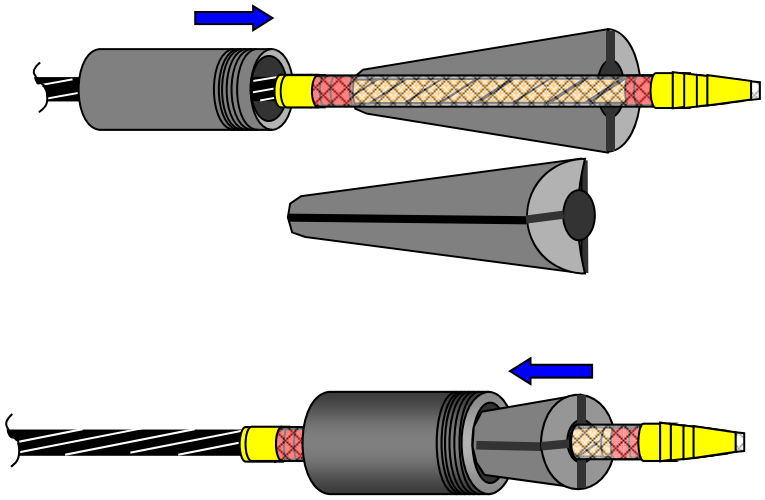
Procedures

See the figures.

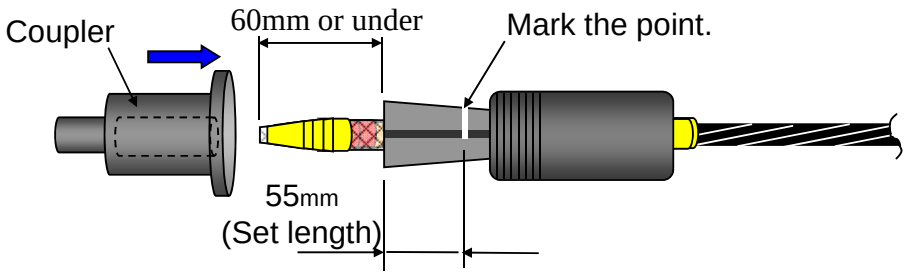
1) Spray molybdenum on the inside of sleeve and the outside of wedges.



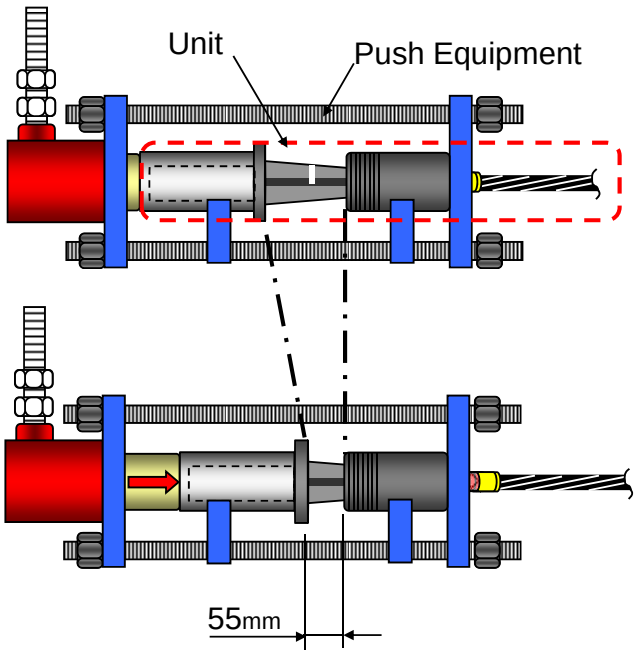
2) Set the wedges.



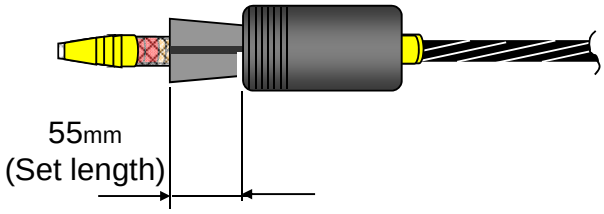
3) Mark the point at 55mm (Set length) from the edge of the wedges.



4) Set the above unit into the Push Equipment.

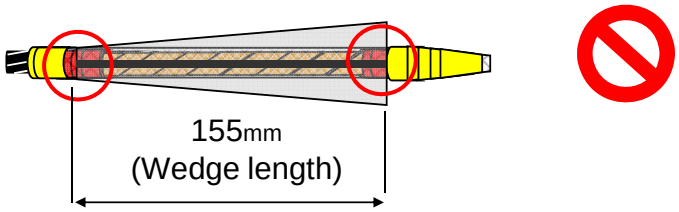


5) Remove from Push Equipment.

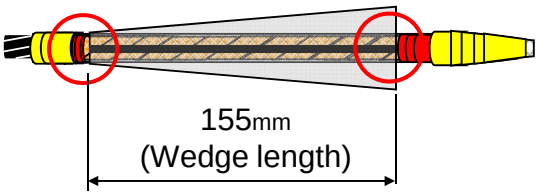


Notices

Do not set the wedges on any tape which fixed the mesh sheet and braid grips.

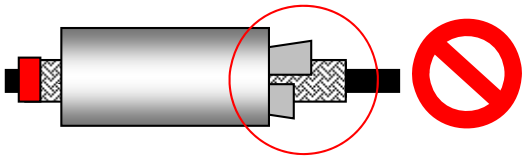


Set the wedges between the fixed tapes

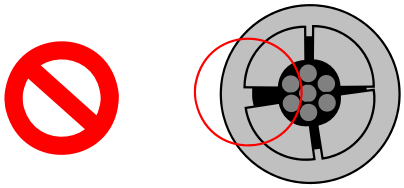


Good

Be careful so that the end face of the wedges does not become uneven.



Do not become uneven the gaps between wedges.

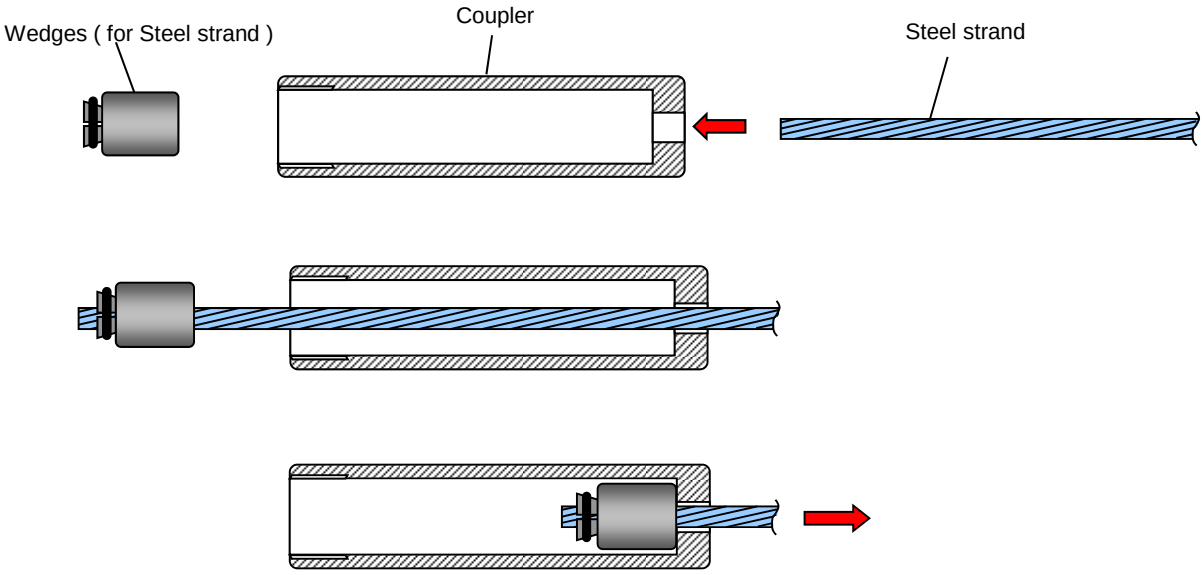


6.2 Method of setting tensioning devices

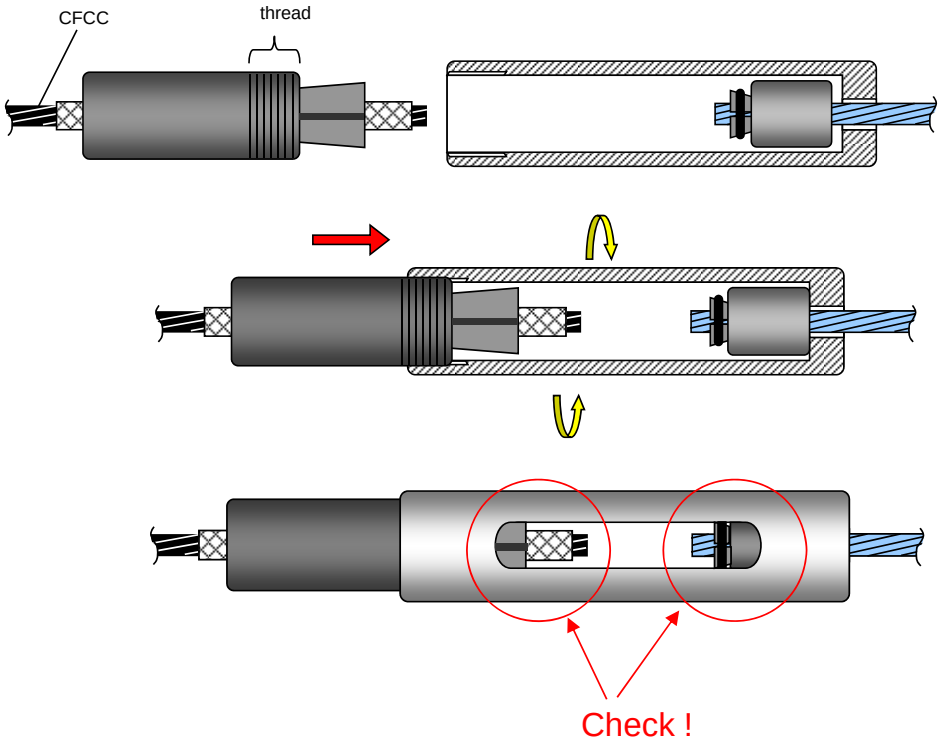
Procedures

See the figures.

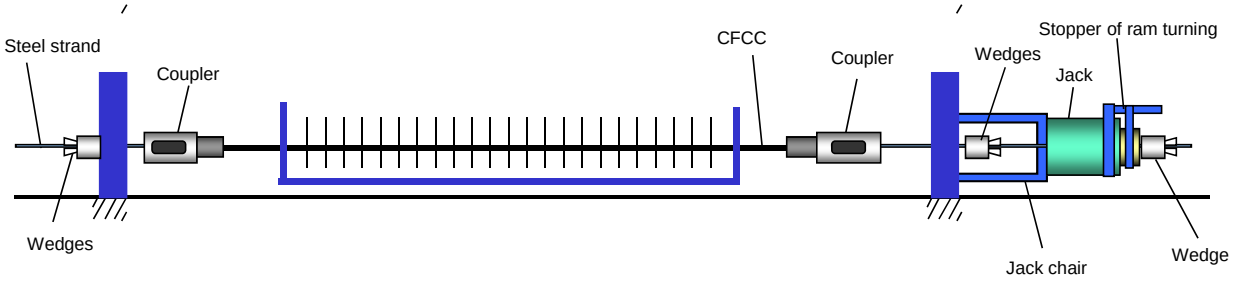
1) Attach the wedges and a coupler to steel strand.



2) Join CFCC to steel strand while turning a coupler.



3) Set up the tensioning devices.



Notices

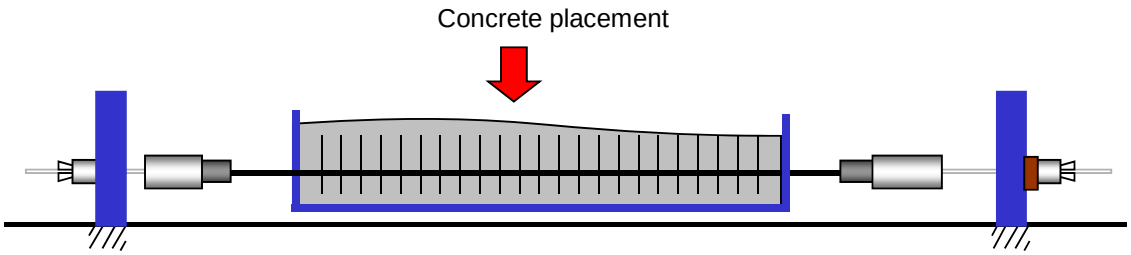
1) Use CFCC and steel strand of same lay direction. (The prevention of cable untwisting.)
2) Fix stopper of ram turning to jack body and ram for prevention of cable untwisting.
3) During tensioning, do not stand behind a jack or do not enter the danger zone thereof.

6.3 Concrete placement and curing

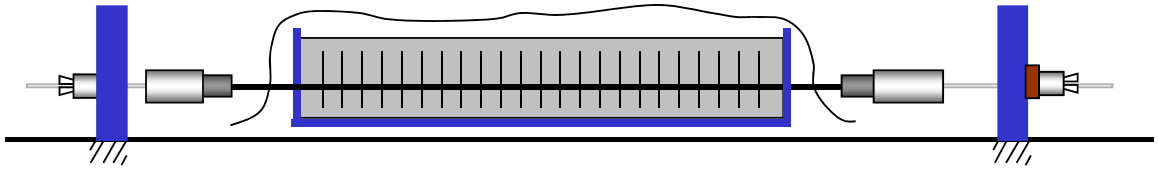
Procedures

See the figures.

1) Concrete placement.



2) Concrete curing.



Notices

The temperature of the anchoring devices shall not exceed 50℃ (122℉).

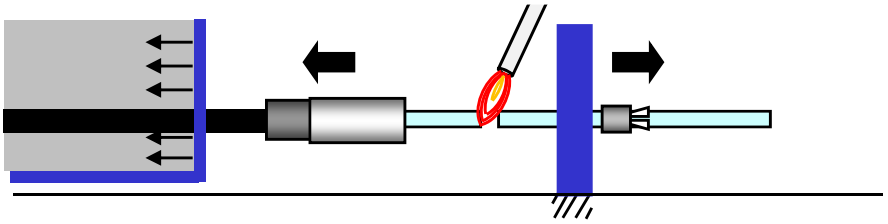
The part of couplers must not be exposed to steam

6.4 Prestressing and disassembly of the couplers

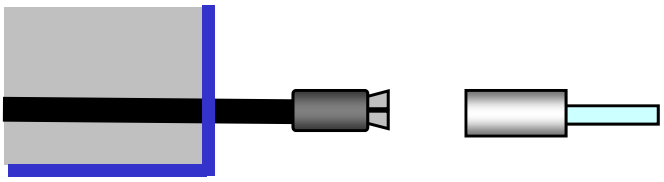
Procedures

See the figures.

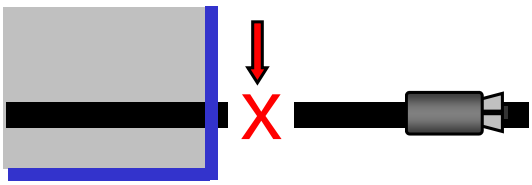
1) Cut off the steel strand by the torch after curing.
   (Prestressing for the concrete beam)



2) Remove the coupler.



3) Using the grinder cutter, cut off CFCC.

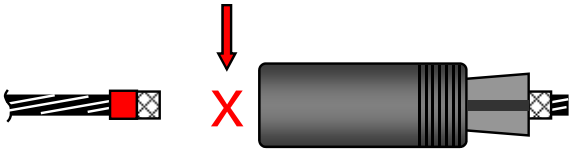


6.5 Removing the wedges from Sleeve

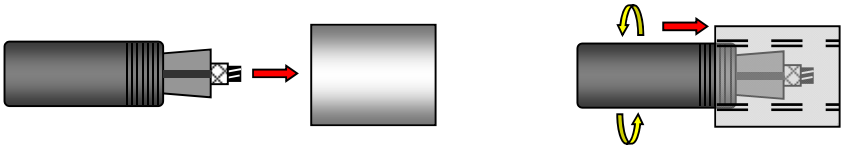
Procedures

See the figures.

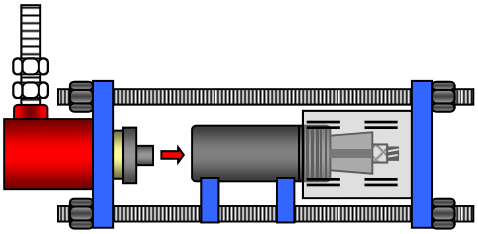
1) Cut off surplus CFCC.



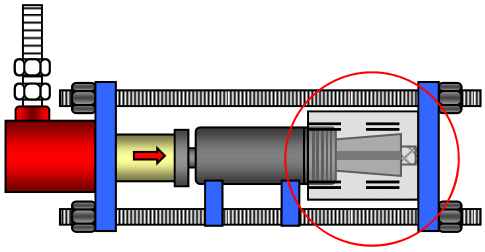
2) Screw a sleeve into the collar.



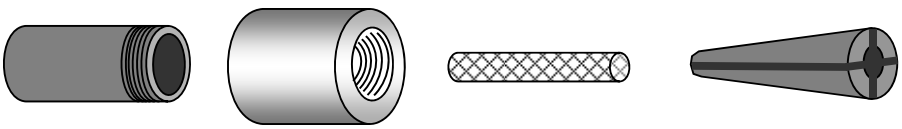
3) Set sleeve with collar at device to release the wedges.



4) Push out the wedges.



5) Remove the wedges from CFCC for reuse.



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