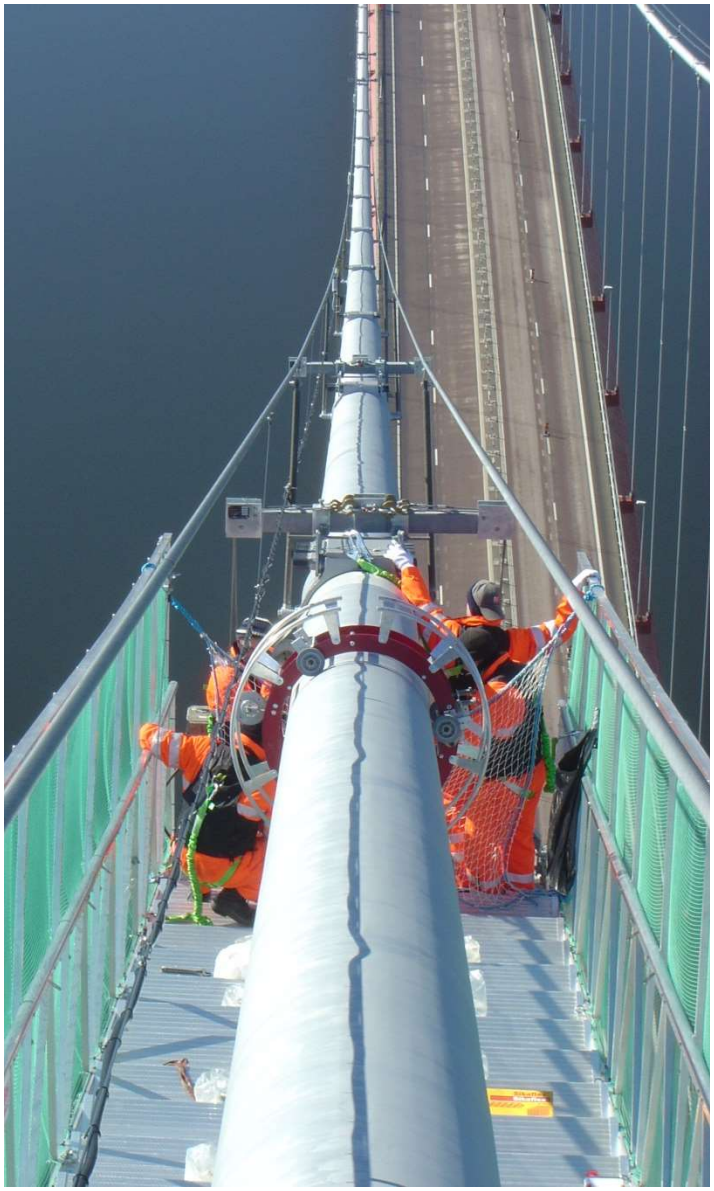
Installation Manual

CABLEGUARD™ ELASTOMERIC WRAP



D.S. BROWN
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INTRODUCTION

Before installation is started, a few items of general nature should be considered. Please read the entire installation manual before beginning installation.

The Cableguard™ Elastomeric Wrap System is designed to provide corrosion protection for civil structures. Cableguard™ material is helically wrapped about the structure for which corrosion protection is desired. The Cableguard™ wrap is then fused using a custom built heating system to form a homogenous barrier between the ambient environment and the underlying structure. In addition to fusing individual layers into a sheath, the electrically operated heating system shrinks the wrap to the underlying structure. The heating system is controlled by an operator's panel located in close proximity to the blanket, thus allowing the operator to match the temperature and timing with ambient conditions. A walk surface is applied after the Cableguard™ wrap has cooled.

HANDLING

When you receive the Cableguard™ wrap it will be packaged in plastic bags. Cableguard™ wrap is formulated to begin curing when it comes in contact with sunlight and moisture, and must therefore be stored in a cool, dry, dark area.

NOTE
Cableguard™ should NOT be installed in the rain. See Appendix F, "Weather Considerations," for information on installation in wet climates and in ambient temperatures below 5°C.

Installation on Suspension Bridges

INSTALLING THE WRAP USING THE SKEWMASTER™

The preferred method of Cableguard™ wrap installation is a custom built wrapping machine called the Skewmaster™. After adjusting the Skewmaster™ for the correct overlap, begin installing the wrap by hand from the upper cable band (Figure 1) in a clockwise or counterclockwise direction as you look up the cable.

1. Beginning at the upper cable band, tape the loose end of a roll of Cableguard™ to the cable so the loose end is facing down in the 9 o'clock position (for clockwise wrapping) or 3 o'clock position (for counterclockwise wrapping). The wrap should come off the roll over the top, with the roll between the cable and the wrap being installed.
2. Wrap around the cable parallel to the cable band until the wrap laps over itself. After a complete double wrap is made, begin moving the wrap up the cable while wrapping, gradually working out to the project specific triple overlap through several rotations.
3. Wrap the first full roll onto the cable by hand. The second roll and subsequent rolls should be installed using the Skewmaster™.

INSTALLING THE WRAP BY HAND WRAPPING

Hand wrapping is necessary on each panel to start and finish the wrapping process where the upper and lower cable bands interfere with the Skewmaster. Hand wrapping is also an acceptable alternative to use of the Skewmaster™ for wrapping entire panels. The subsequent procedures should be followed to properly install Cableguard™ by hand wrapping.

1. Beginning at the upper cable band, tape the loose end of a roll of Cableguard™ to the cable so the loose end is facing down in the 9 o'clock position (for clockwise wrapping) or 3 o'clock position (for counterclockwise wrapping). The wrap should come off the roll over the top with the roll between the cable and the wrap being installed.
2. Wrap around the cable parallel to the cable band until the wrap laps over itself. After a complete double wrap is made, begin moving the wrap up the cable while wrapping, gradually working out to the project specific triple overlap through several rotations.
3. The wrap should be consistently tensioned as it progresses up the panel. The downhill operator will be able to provide the most tension and should consistently pull the wrap tight as it is passed to the uphill operator. The uphill operator also has a responsibility to tension the wrap.
4. Consistent overlap and tension are key to prevent bulging and sagging of the wrap.

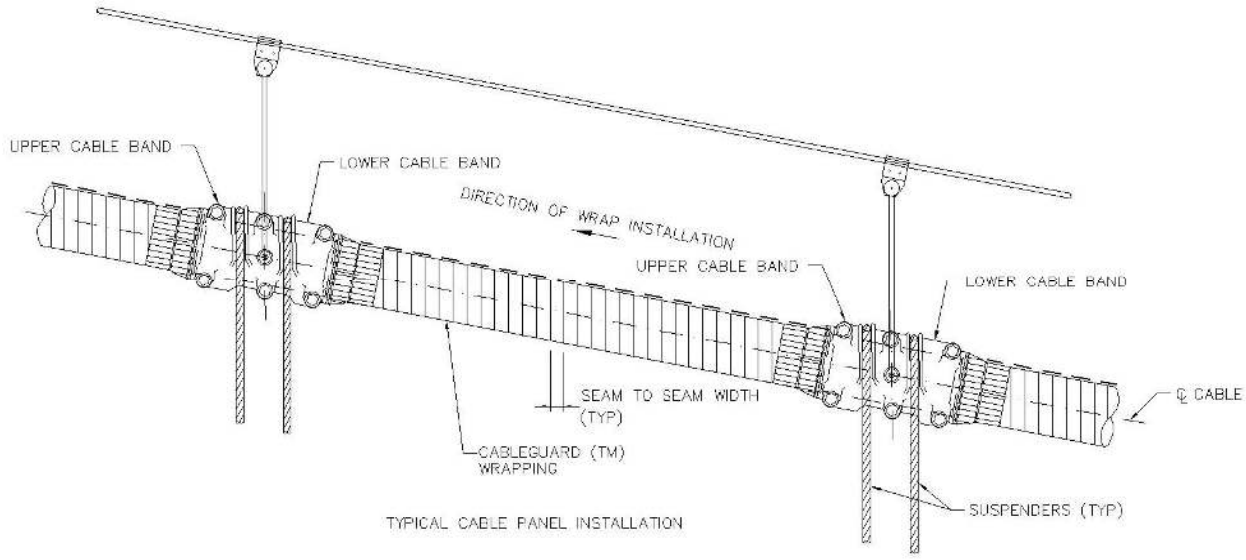

FIGURE 1 CABLE SECTION SHOWING LOWER AND UPPER CABLE BANDS ON A SUSPENSION BRIDGE

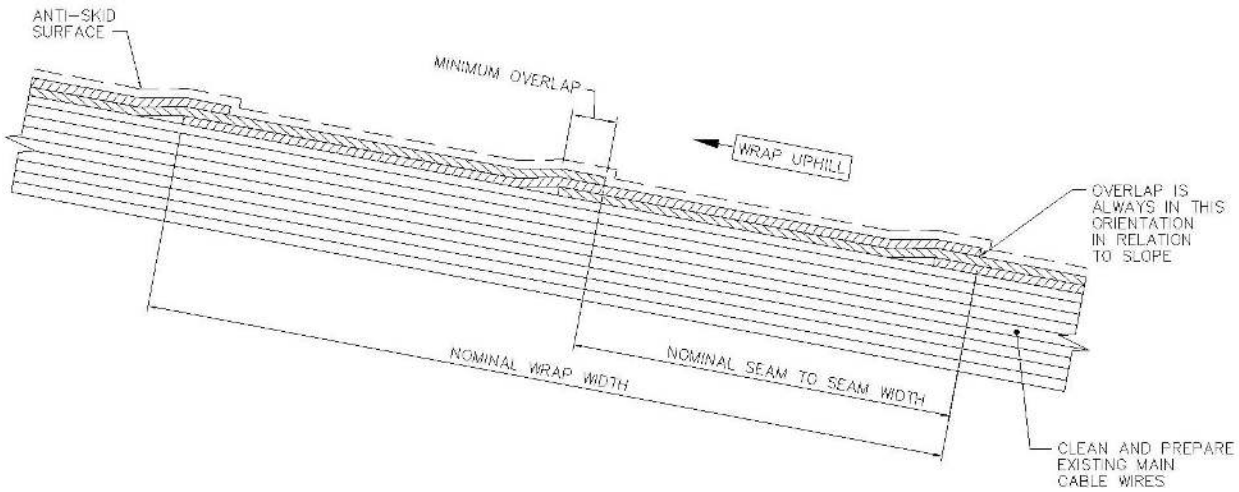

FIGURE 2 CABLEGUARD™ OVERLAP

TABLE 1 CABLEGUARD™ MINIMUM TRIPLE OVERLAP TOLERANCES

Nominal Wrap Width	Nominal Seam to Seam Width	Minimum Overlap	Maximum Overlap
150 mm	72 mm	3 mm	Per Job Specification
200 mm	97 mm	3 mm	
250 mm	122 mm	3 mm	
300 mm	147 mm	3 mm	

NOTE

Triple overlap (TO) may be calculated using the following formula:
TO = Wrap Width – (Seam-to-Seam Width 1 + Seam-to-Seam Width 2)

SPLICES

When coming to the end of a roll, a splice must be made in the wrap using the following procedure:

1. While maintaining tension on the wrap that is in place, unwind the remaining wrap.
2. Cut the wrap so that the splice will occur 90° to the top of the cable.
3. Tape the loose end in place using duct tape or heat seam the loose end to the overlapping tail using a heat gun and stitching roller .
4. Begin wrapping with the new roll making a 50mm overlap. The lap should be made so that the exposed end faces down (Figure 3 Splice Overlap).
5. If the loose end was held in place with tape, remove the duct tape that held the splice together after making approximately three wraps with the new roll.

NOTE

Rolls may contain factory splices, which may be installed in any position.

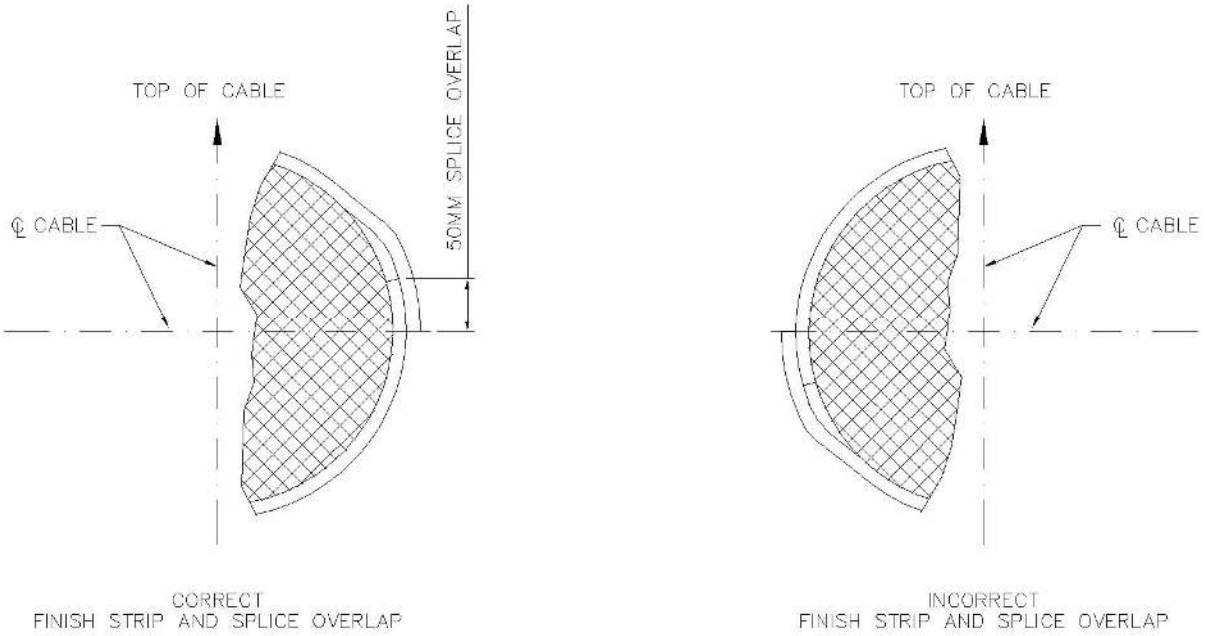

FIGURE 3 SPLICE OVERLAP

(shown for clockwise installation)

HEATING THE WRAP

NOTE

It is important that the wrap to be heated within 24 hours of installation. Follow "Weather Considerations" provided in Appendix F if the wrap is left unheated overnight or is not heated within 24 hours of installation.

WARNING

Do not connect the control box directly to a power source. You must provide a fusible disconnect at the power source rated for the blanket current and voltage that will provide overcurrent/short circuit protection!

WARNING

Connecting the blanket and controller to improper voltage can cause serious damage. Have a qualified electrician verify that the supply voltage matches the blanket voltage!

NOTE

See chart in Appendix A-1 for power supply cable sizing.
See chart in Appendix A-2 for generator sizing.

1. Connect the controller to a power source matching the blanket's voltage and current ratings. The power source must be effectively grounded (National Electrical Code NFPA 70-250).
2. Attach the blanket to the section to be heated. The male power plug from the blanket plugs into the female plug on the controller.
3. The temperature sensing thermocouple coming from the blanket is integrated into the power plug. As supplied, the blanket temperature is regulated from the thermocouple located in the center heating element.
4. Turn the "Power" switch to the on position. Use the up/down arrows to set the initial temperature to 260°F (127°C) on the controller. Generally, 260°F (127°C) is a good starting temperature at which to adjust the controller's temperature set point. Actual temperature set point and heating cycle time balance needed to produce a quality bond between layers of Cableguard™ material will vary and should be determined by the contractor in the field.
5. Verify thermocouple operation by reading the "process" temperature. On initial startup, prior to applying power, process temperature on the controller should display ambient temperature. Thermocouple accuracy is relative to the thermocouple embedment location within the heating blanket and should be used as a reference point only. One thermocouple embedment is typically supplied for each element.

NOTE

On initial startup always verify proper thermocouple operation by reading ambient temperature on the controller. If ambient temperature is not displayed, switch to another thermocouple.

6. Compressed air supply should always be connected to the pressure regulator shipped with the blanket controller. This regulator maintains 3.5 psi (24kPa) on the blanket. After connecting the regulated air pressure to the blanket via the quick disconnect, inflate the blanket to 3.5 psi (24kPa) by opening the 3 way valve. Verify correct pressure at the blanket. To deflate the blanket turn the 3 way valve handle 90°.

To avoid damage to the inflatable blanket bladder, the blanket should never be inflated to a pressure higher than 5 psi (34kPa)

7. With the blanket in place, controller power on, and air pressure on the blanket, push the "Blanket #X Start" button. When the controller senses that air pressure is present on the blanket, it will make a short beep sound and power will be applied to the blanket. Depending on ambient conditions, it can take up to 10 minutes or more for the blanket to come up to temperature after power is applied to the blanket. The timer and temperature settings should be adjusted to obtain an optimum material bond without overheating. It is preferable to heat the Cableguard™ material for a longer time at a lower temperature than to try and turn the temperature up to high to achieve faster times. The temperature controller has been limited to 300°F (150°C).

WARNING

The blanket should never be operated above 300°F (150°C). Operating above this temperature will damage the wrap.

WARNING

The blanket should always be in contact with the cable when the "Blanket" switch is turned on.

8. When heating works is set to begin and the blanket is at ambient temperature the timer must be set at 2 minutes for the first section of cable. The timer will begin when the blanket temperature reaches 10°F (5.5°C) from the temperature set point on the controller.
9. After completing the heating of the first section of cable the timer will need reset to between 4-5 minutes per heat cycle. The exact time should be adjusted to obtain an optimum material bond without overheating.
10. Upon hearing the audible indicating the cycle is complete, release the air pressure from the bladder, rotate the blanket approximately 20° on the cable. Re-inflate the bladder and push the start button.

FIGURE 4 BLANKET DOUBLE CONTROLLER

11. Place a mark on the Cableguard™ material at the unheated edge with an ink pen. Upon hearing the audible alarm, release the air pressure from the bladder, and move the blanket up the cable to the next unheated section. The lower edge of the heating element should have a small overlap with the mark indicating the unheated edge. Repeat steps 8 and 9 in this location.

FIGURE 5 INFLATABLE BLANKET

12. Verify that 4 minutes has been long enough to properly bond the material. If the material is not bonded, increase the time and/or temperature accordingly. If the material is burnt, decrease the time and/or temperature accordingly.
13. When approximately two blanket lengths remain to be heated, measure the distance from the end of the blanket to the cable band. If it is less than two times the blanket length minus 150mm, skip to the end section, heat it first, then back up one blanket length to finish heating. This allows the section that would otherwise have been heated twice to cool before being heated again. (Example: the blanket is 750mm long, you have about two more heats to finish to the cable band. You measure 1,150mm of unheated material. Two times the blanket length is 1,500mm minus 150mm = 1350mm. Move the blanket to the very end, heat, and then move back 750mm.)
14. After the wrap has been heated, it needs to cool without being disturbed. This usually takes 10 to 15 minutes.
15. Small areas of Cableguard™ wrap may fail to properly bond due to cable irregularities or other obstructions, such as wire repairs, over which Cableguard™ is wrapped. A bond is considered acceptable when the exposed edge of the wrap cannot be lifted by a finger after cooling. In other words, the reveal edge has become bonded with the layer below. Areas that are not properly bonded should be reheated and seamed using a heat gun and stitching roller or a heating blanket. The selection of either a heat gun and stitching roller or a heating blanket is left to the discretion of the contractor.

16. **OPTIONAL**: Two heating blankets may be used simultaneously on a single panel. The first blanket is placed on the cable at the cable band with the restraining buckles facing the 3 o'clock position (positioning is given as a reference only; actual positioning is left to the discretion of the contractor). The section is heated for a single cycle and the blanket is moved to the next position up the panel without rotating. When the first blanket has reached its third position on the panel, the second blanket may be placed at the cable band with the restraining buckles rotated approximately 30° from the restraining buckles on the first blanket. The second blanket will follow the progress of the first blanket up the panel without rotating either blanket.
17. **OPTIONAL**: At the discretion of the contractor, the Cableguard™ abutting the lower cable band may be heated prior to working up the panel from the starting point. The Cableguard™ abutting the lower cable band should be heated using the end seal heating blanket for two cycles with a blanket rotation between the cycles prior to continuing work from the starting point up the panel. A standard blanket along with a heat gun may also be used to heat the lower cable band prior to working up the cable from the starting point. This would enable finishing work to be performed at the cable band locations while the balance of the panel is being heated.
18. **OPTIONAL** (see job specifications): Locate the low point at the center of the bridge. A 25mm diameter hole may be cut in the Cableguard™ material at the low point of the suspension bridge on the bottom side of the cable. This will allow any water that may have entered the cable to escape at the lowest point.

NOTE
Blanket life is approximately 1,000 heating cycles.

STANDARD CABLE BAND PREPARATION

On a suspension bridge there is an upper and lower part to each saddle. They are identified in Figure 6 below.

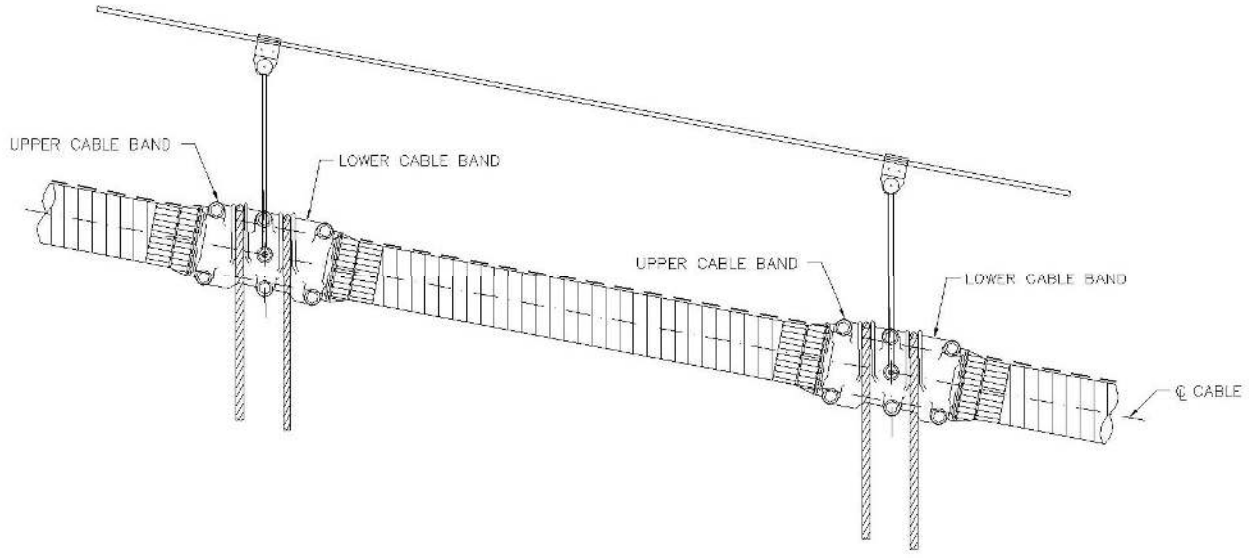

FIGURE 6 CABLE SECTION SHOWING UPPER AND LOWER CABLE BANDS ON A SUSPENSION BRIDGE

Lower Cable Band Preparation

1. The lower cable band area is prepared by cutting a neoprene sealing wedge to length and wrapping it around the cable close to the cable band. The wedge should fit snugly around the cable. The wedge is installed after the Cableguard™ wrap has been installed.

FIGURE 7 WEDGE INSTALLATION

NOTE

It is important to install the lower wedge with the joint 90° to the top of the cable (Figure 8 Lower Neoprene Sealing Wedge Installation).

2. The wedge ends are held together using super glue supplied by D.S. Brown. Apply a small amount of glue to the cut edge, hold the parts together for approximately 20 seconds, and then release. A 9.5mm stainless steel band is then installed in the groove on the wedge and snugged into place around the banding clip (Figure 9). Slide the clamp on the strap and bend the end under at the ear side of clamp (Figure 10). Do not tighten the banding clip at this time.

NOTE

It is important to make sure the banding goes under the clip (Figure 10).

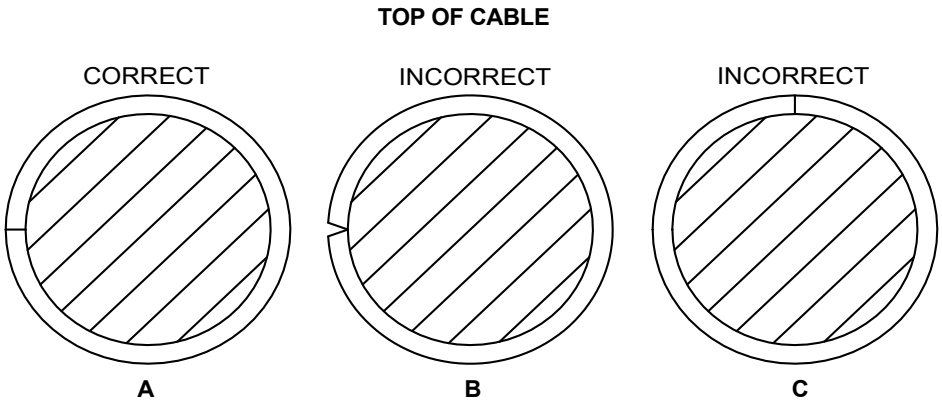

FIGURE 8 LOWER NEOPRENE SEALING WEDGE INSTALLATION

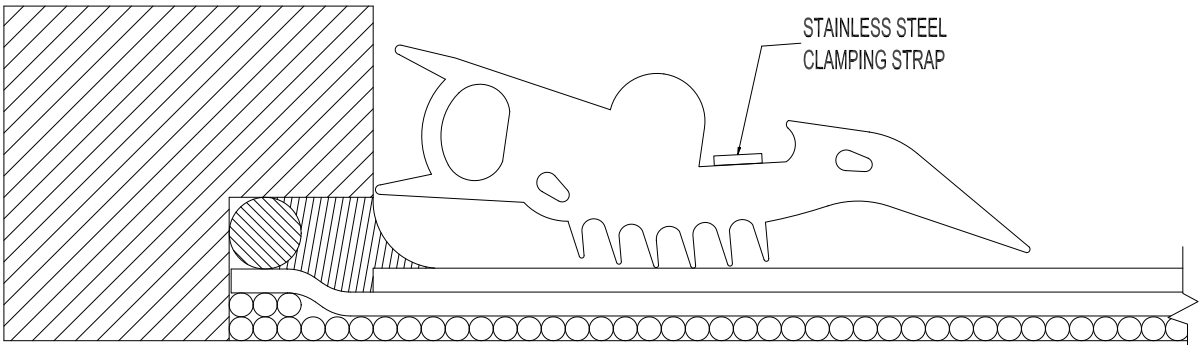

FIGURE 9 STAINLESS STEEL BAND INSTALLATION

3. Move the wedge to within 50mm of the cable band. Apply a 6mm bead of caulk around the cable band where the wedge will contact it. Slide the wedge until it is in intimate contact with the cable band. Using the band-tightening tool, tighten the band and cinch it with the banding clip by folding the retention ears over the band (Figure 10). It may be necessary to use a hammer to move the wedge tight to the cable band.

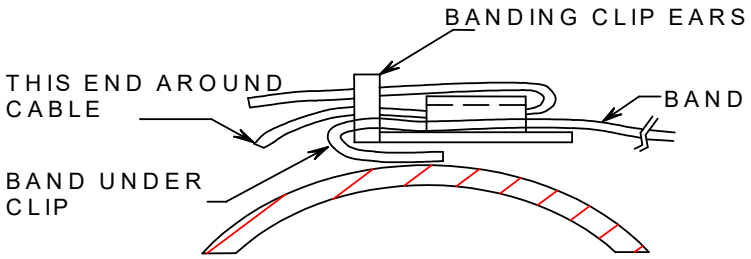

FIGURE 10 BANDING CLIP INSTALLATION

Upper Cable Band Preparation

1. The upper cable band area is prepared by cutting the sealing wedge to length and wrapping it around the cable so it fits snugly around the cable with a 12mm gap at the bottom.

NOTE
It is important to install the wedge with the 12mm open joint on the bottom side of the cable. Figure 11 shows what a correctly installed lower sealing wedge will look like in section.

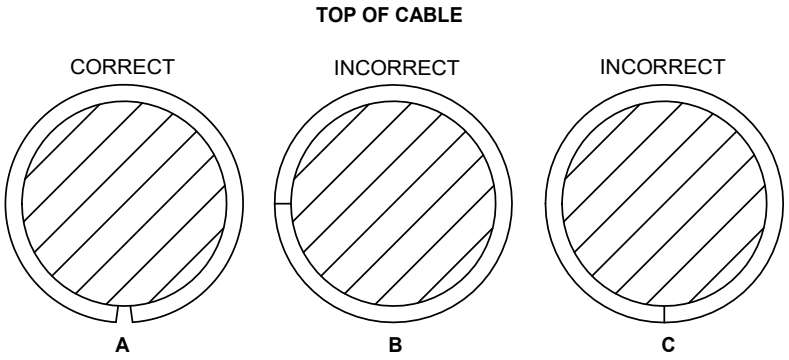

FIGURE 11 UPPER CABLE BAND NEOPRENE SEALING WEDGE INSTALLATION

2. The wedge ends are assembled using two 4.7mm plastic barbs inserted into the holes in the end of the wedge. When the wedge is installed there should be a 12mm gap between wedge ends as shown in Figure 11. A 9.5mm stainless steel band is then installed in the groove on the wedge and snugged into place around the banding clip (Figure 9). Slide the clamp on the strap and bend the end under at ear side of clamp (Figure 10). Do not tighten the banding clip at this time.

FIGURE 12 WEDGE GAP AND PLASTIC BARBS

3. Move the wedge to within 50mm of the cable band. Apply a 6mm bead of caulk around the cable band where the wedge will contact it. Do not apply caulk to the bottom of the cable band at the 12mm gap. Slide the wedge until it is in intimate contact with the cable band. Using the band-tightening tool, tighten the band and cinch it with the banding clip by folding the retention ears over the band. It may be necessary to use a hammer to move the wedge tight to the cable band.

FIGURE 13 APPLYING CAULK

FIGURE 14 SLIDING WEDGE INTO PLACE

FIGURE 15 BAND TIGHTENING TOOL

FIGURE 16 BAND RETENTION CLIP

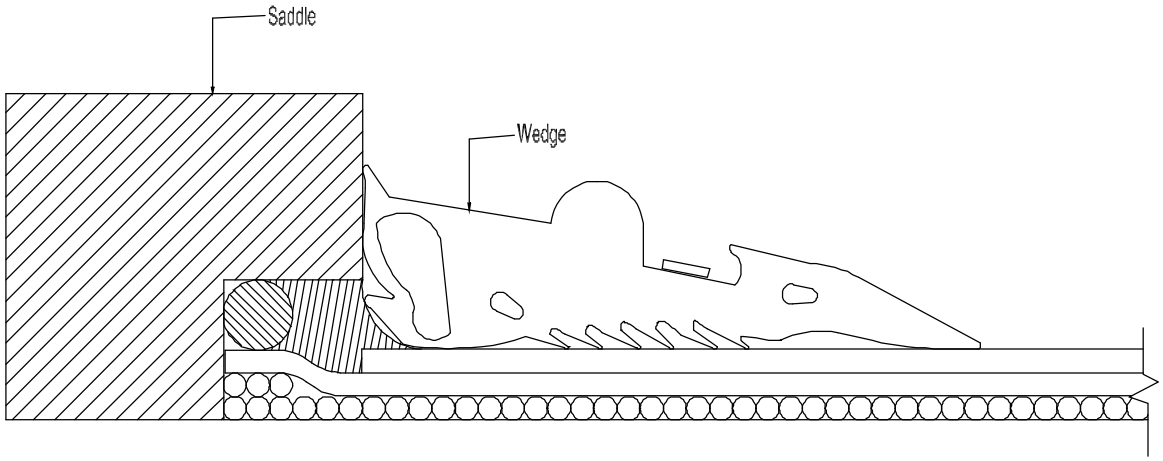

FIGURE 17 COMPRESSED WEDGE INSTALLATION

4. The finish strip is installed next over the wedge. Before installing the finish strip, the area where the strip will be applied must be cleaned with xylene. This procedure is the same for both upper and lower cable band locations. Wrap un-reinforced Cableguard™ finishing strip material around the cable and cut it to a single wrap length, leaving an extra 50mm to 75mm of overlapping material. The 50mm to 75mm overlap should be made so that the exposed end faces down (Figure 11). It is then heated to itself using a heat gun and roller (Figure 19).

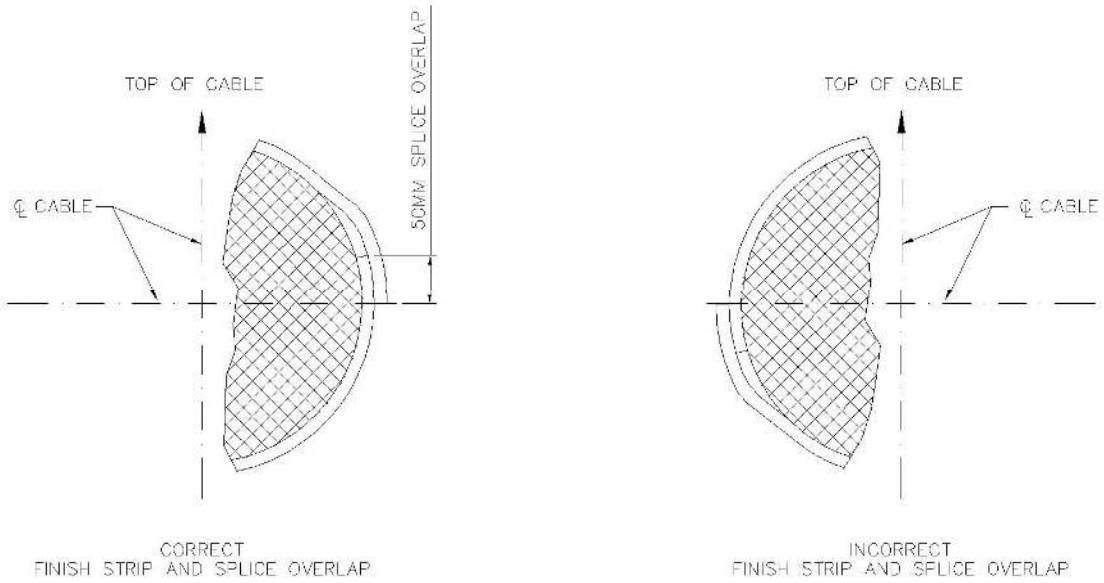

FIGURE 18 FINISH STRIP INSTALLATION AND SPLICE OVERLAP

5. After forming a snug loop around the cable with the finishing strip it is pulled back over itself and moved close to the wedge (Figure 20). The finish strip is then snapped over the wedge so that it covers the wedge (Figure 21), and a final 9.5mm stainless strap is installed behind the indicating bump on the wedge (Figure 22).
6. Heat the finishing strip with a heating blanket.

FIGURE 19 HEATING FINISH STRIP

FIGURE 20 FINISH STRIP PULLED BACK

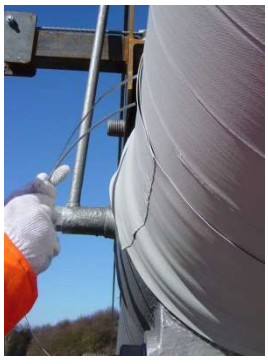

FIGURE 21 FINISHED STRIP SNAPPED OVER WEDGE

FIGURE 22 STRAP INSTALLED BEHIND INDICATOR BUMP

7. Cut a 10mm wide by 15mm long slot on the upper cable band finishing strip and align this slot with the wedge gap as shown in Figure 23.

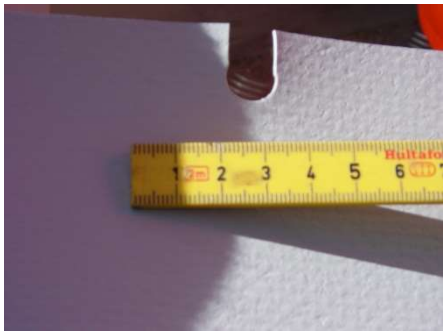

FIGURE 23 10MM WIDE BY 15MM LONG SLOT

FIGURE 24 OPTIONAL 10MM HOLE

8. **OPTIONAL** (see job specifications): A 10mm diameter hole located 90mm from the cable band and in the 6 o'clock position may be cut on the lower cable band finishing strip, as shown in Figure 24. This will allow any water that may have entered the cable to escape at the lowest point between the cable bands.

DEHUMIDIFIED CABLE BAND PREPARATION

Cable Band Without Wedge Seal (Caulk Only):

1. Before beginning any work at the cable band first clean the cable band recess with a wire brush or other utensil approved by the engineer.
2. Once it has been ensured that no dirt, debris, or moisture are present in the cable band recess, wrap a strip of un-reinforced Cableguard™(30 mil) around the cable. Cut the un-reinforced material to a single wrap length, leaving an extra 50mm to 75mm of overlapping material. The 50mm to 75mm overlap should be made so that the exposed end faces down.
3. Heat the unreinforced wrap to itself using a heat gun and roller then slide the unreinforced wrap into the band recess as deep into the groove as possible. Work the heat gun around the cable band recess which will tighten the unreinforced wrap on the cable inside the recess.
4. Once the unreinforced wrap has been installed, begin wrapping at the cable band with Cableguard™ standard 45mil wrap as laid out in the "Standard Cable Band Preparation" section above. Using an end seal blanket at the lower cable band prior to continuing work up the cable will enable finishing work to be performed at the cable band locations while the balance of the panel is being heated.
5. Once the wrap abutting the lower cable band has cooled, clean the Cableguard™ where caulk will be applied with xylene. Once the xylene has dried, caulk the joint as shown in the contract drawings.

6. Caulk must be allowed to fully cure in order to achieve a tight seal (24-48 hours for 1/4" diameter bead). If more than a 1/4" diameter bead of caulk is being applied inside the cable band recess then please contact D.S. Brown for expected cure times.

Cable Band With Wedge Seal:

1. Before beginning any work at the cable band first clean the cable band recess with a wire brush or other utensil approved by the engineer.
2. Once it is insured that no dirt. debris, or moisture are present in the cable band recess, begin wrapping the cable with Cableguard™ 45mil reinforced wrap. After one full wrap around the cable, slide the reinforced wrap as deep into the cable band as possible and apply tension to the wrap to tighten it on the cable.
3. Continue wrapping up the cable by hand. Using an end seal blanket at the lower cable band prior to continuing work up the cable will enable finishing work to be performed at the lower cable band locations while the balance of the panel is being heated.
4. After heating the Cableguard™ abutting the lower cable band, verify the wrap end just outside the cable band is bonded. If not, use a heat gun to bond the loose end of the wrap.
5. Install the wedge over the wrap with no gap between the wedge. The wedge splice for both upper and lower cable band locations should be placed at 90° as shown in Figure 8A on page 12. Move the wedge to approximately 50mm from the cable band.
6. Install the stainless steel band in the wedge seal groove but do not tighten the band.
7. Clean the area between the wedge seal and the cable band with xylene. When the xylene has dried, caulk the cable band recess as shown in the contract drawings.
8. Slide the wedge seal into place as shown in Figure 14 on page 14. The wedge seal should compress into the cable band face as shown in Figure 17 on page 15.
9. Caulk must be allowed to fully cure in order to achieve a tight seal (24-48 hours for 1/4” diameter bead) prior to applying pressure from the dehumidification system.
10. Finishing strip can be applied following steps 4 to 6 beginning on page 15.

DURA-GRIP™ WALK SURFACE APPLICATION

Dura-Grip™ Walk Surface is an anti-slip coating that provides traction for workers walking the cables after Cableguard™ has been installed. If the optional anti-slip walk surface is specified, it must be APPLIED WITHIN 7 DAYS of heating the Cableguard™ wrap. Apply the anti-slip walk surface as follows:

1. Verify proper conditions for the installation:
   a. Outdoor temperature is between 40°F (4.5°C) and 110°F (43.5°C)
   b. The coating material is between 40°F (4.5°C) and 100°F (43.5°C)
      i. After storage at temperatures below 40°F (4.5°C), store adhesive or top coat at room temperature (72°F or 22°C) for at least three days before using.
   c. The wrap surface is between 40°F (4.5°C) and 110°F (43.5°C)
   d. The relative humidity is between 0% and 90%

e. The wrap surface to be coated is 5°F (3°C) above dew point.
f. There is no moisture on the area to be coated.

2. Thoroughly wipe down the Cableguard™ with xylene where the walk surface is to be applied.
3. Mask off the area where the walk surface is to be applied to ensure a uniform width on top of the cable as required in the job specifications (Figure 27).
4. After thoroughly mixing the contact adhesive (45-1), apply a heavy coat with a brush or roller the full width of walk surface from band to band . While applying the contact adhesive, immediately sprinkle grit (45-2) into the wet contact adhesive at a rate of 0.15 lb ft^2 to 0.20 lb ft^2 (Figure 25) . Minimizing grit application on the longitudinal edges of the walking surface provides the best top coat edge bond. See appendix E for coverage and application rates.

FIGURE 25 CORRECT GRIT APPLICATION

5. Once the contact adhesive no longer lifts or strings when touched (Figure 26) the top coat may be applied. Mix part A and B of the top coat and apply in a longitudinal direction followed by a transverse direction to fill voids. Total coat thickness is 5-7 mils and pot life of the mixed top coat is 2.5 hours at 68°F (20°C). If used, masking tape should be removed right after application of the top coat (Figure 27). An additional top coat may be applied if needed after the “Dry to Handle/Recoat” times shown in Table 1 in Appendix E.

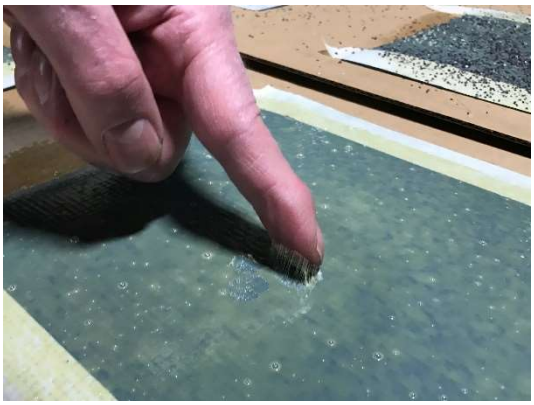

FIGURE 26 45-1 BASE COAT LIFTING & NOT READY FOR TOP COAT APPLICATION

FIGURE 27 MASKING TAPE BEING REMOVED DIRECTLY AFTER TOP COAT APPLICATION

6. Top coat should be applied the same day as the contact adhesive and grit. If same day top coat application is not possible, see appendix E for application procedure allowing up to 5 days after contact adhesive and grit application.

*See figure 28 below for an example of a correct finished walk surface.

FIGURE 28 CORRECT FINISHED WALK SURFACE

Installation on Cable-Stayed Bridges

Because there is no cable band on cable-stayed bridges, installation is straightforward.

1. Begin wrapping as outlined in the section “Installing the Wrap” under the heading “Installation on Suspension Bridges”.
2. Heat the wrap as outlined in the section “Heating the Wrap” under the heading “Installation on Suspension Bridges”.
3. Allow time for the wrap to cool.
4. After a complete section of cable is wrapped, heated and cooled, fold the top end up on itself, and apply a 6mm bead of caulk around the cable where the wrap starts and finishes. Then roll the wrap over the caulk and apply a stainless steel band to seal the area as in step 5 of the section “Upper Cable Band Preparation” under the heading “Installation on Suspension Bridges”. Apply a second stainless steel band to the bottom of the cable, but do not use caulk.

D.S. Brown can also supply transition boots to maintain an impervious seal in areas where cable diameters change dramatically. (Figure 29).

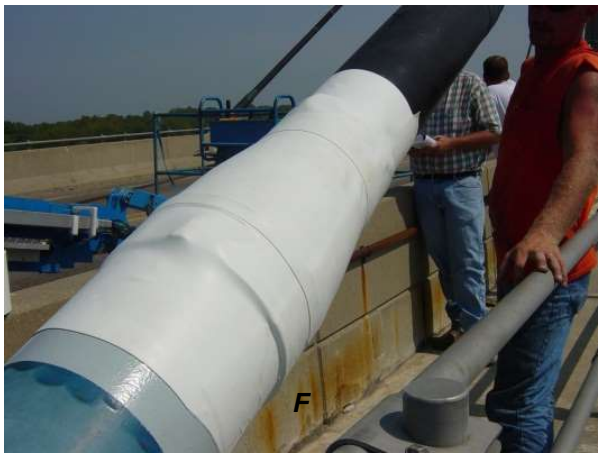

FIGURE 29 TRANSITION BOOT

Appendix A-1 Maximum Amperage for Length of Conductor

TABLE 2 MAXIMUM AMPERAGE FOR GIVEN LENGTH OF CONDUCTOR AND CONDUCTOR SIZE

Length	#12	#10	#8	#6	#4
100’	20	25	35	45	60
200’	20	25	35	45	60
300’	20	25	35	45	60
400’	15	24	35	45	60
500’	12	19	30	45	60

Appendix A-2 Generator Sizing

TABLE 3 THREE PHASE GENERATOR SIZING

Three Phase Generator Sizing			
	Generator Output Voltage		
	480	380	240
Generator KW	Maximum Amperes		
10	11	14	22
15	16	21	33
20	22	28	44
25	27	35	55
30	33	41	66
35	38	48	77
40	44	55	87
45	49	62	98
50	55	69	109

Notes:

1. Chart is calculated with unity power factor for blanket loads and a 10% allowance for variances.
2. Standard blanket voltage supply is 480 volt 3 phase (3 phases plus ground).
3. Any blanket voltage is available. Contact D.S. Brown for more information.
4. Contact D.S. Brown for single phase equipment.

Appendix B Cableguard™ Repair Instructions

There are three basic types of damage:

Type 1: Cut

Type 2: Tear or puncture

Type 3: Burn from overheating the wrap

TYPE 1: CUT

Cut less than 75mm long

Cuts less than 75mm in length can be repaired with a patch (Figure 29). Cut the patch in a square shape 100mm longer than the cut length (Figure 30). For example, if the cut is 50 mm long, make a patch that is 150mm by 150mm. Use scissors to round the corners of the patch.

1. Clean the area to be patched, as well as the patch itself, with xylene (Figure 31 and Figure 32).
2. Apply the patch using a heat gun and silicone roller (Figure 33). Ensure that the entire patch is well bonded.

FIGURE 29 CUT LESS THAN 75MM LONG

FIGURE 30 PATCH 100MM LONGER THAN CUT

FIGURE 31 CLEAN PATCH WITH XYLENE

FIGURE 32 CLEAN AFFECTED AREA

FIGURE 33 APPLY THE PATCH USING A HEAT GUN AND ROLLER

Cut greater than 75mm long

Cuts greater than 75mm long must be repaired by wrapping over the damaged area with new Cableguard™ material.

1. Clean the existing wrap at least 50mm beyond each end of the cut around the entire circumference of the cable using xylene (Figure 31 and Figure 32). If the walk surface is installed, you must use solvent to remove it at least 50mm beyond each end of the cut before overwrapping.
2. Wrap reinforced Cableguard™ material over the cut and completely around the cable, overlapping per job specifications. Continue wrapping until the patch wrap extends at least 50mm beyond the cut area on each side.
3. Use the heating blanket to bond the patch using the normal heating procedure.
4. Reinstall the walk surface in the overwrapped area.

TYPE 2: TEAR OR PUNCTURE

This type of damage is usually caused by physical contact from equipment or falling debris. Tears or punctures less than 75mm in length can be repaired with a simple patch the same way a cut less than 75mm is repaired as described above. Tears or punctures greater than 75mm in length should be repaired as follows:

1. Cut a filler patch to match the size and shape of tear or puncture (Figure 36).
2. Clean the area to be patched, as well as the patch itself, with xylene (Figure 31 and Figure 32).
3. Apply the patch using a heat gun and silicone roller (Figure 37). Ensure that the entire patch is well bonded.
4. After filling torn areas, tears or punctures should be patched or overwrapped the same way a cut greater than 75mm is repaired as noted above.

FIGURE 34 PUNCTURE REQUIRING CUT PROCEDURE

FIGURE 35 TEAR

FIGURE 36 CUT 2-PLY FILLER PATCH TO MATCH TEAR

FIGURE 37 APPLY FILLER PATCH WITH A HEAT GUN AND ROLLER

TYPE 3: BURN

There are three types of burns caused by overheating the wrap:

A) A burn that has overheated the wrap only on the surface. No repair is necessary.

B) A burn that has melted the wrap down to the reinforcement mesh not more than halfway through.

C) A burn that has melted the wrap past the reinforcement mesh.

FIGURE 38 TYPE B BURN

FIGURE 39 TYPE C BURN

Type 3B Burn Repair (Figure 38)

Burns that have melted the wrap down to the reinforcement mesh but not more than halfway through the material thickness may be repaired using a simple patch as described in “Cut less than 75mm long”. Burn patches must be 100mm wider than the burnt area. For example, a burn 112mm wide would require a patch at least 212mm wide. Use scissors to round the corners of the patch.

Type 3C Burn Repair (Figure 39)

Burn less than 75mm long

Burns that have melted the wrap past the reinforcement mesh and are less than 75mm in length can be repaired with a patch as described in “Cut less than 75mm long”. Cut the patch in a square shape 100mm longer than the burn length (Figure 30). For example, if the burn is 50 mm long, make a patch that is 150mm by 150mm. Use scissors to round the corners of the patch. It may be easier to use the heating blanket depending on the situation.

Burn greater than 75mm long

Burns that have melted the wrap past the reinforcement mesh and are greater than 75mm long must be repaired by wrapping over the damaged area with new Cableguard™ material as described in “Cut greater than 75mm long”.

Appendix C Tool List

- Hammer
- Caulk Gun
- Band Tightening Tool
- Tin Snips
- Tape Measure
- Utility Knife
- Scissors
- Heat Gun
- Roller
- Standard Wrenches
- Xylene
- Small Air Compressor
- Pliers

Appendix D Approximate Time Temperature Setting For Heating Blankets

TABLE 4 APPROXIMATE TIME TEMPERATURE SETTING FOR BLANKET IN U.S. STANDARD UNITS

Approximate Time Temperature Setting For Blanket in **U.S. Standard Units**											
	Temperature °F										
Wind Speed - mph	40	45	50	55	60	65	70	75	80	85	90
	Time in Minutes										
0	5	5	5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5	5	5	5
10	6	5	5	5	5	5	5	5	5	5	5
15	7	7	6	6	5	5	5	5	5	5	5
20	8	7	7	6	5	5	5	5	5	5	5
25	10	9	8	7	6	6	5	5	5	5	5
30	12	11	10	9	8	7	6	5	5	5	5

TABLE 5 APPROXIMATE TIME TEMPERATURE SETTING FOR BLANKET IN METRIC UNITS

Approximate Time Temperature Setting For Blanket in **Metric Units**											
	Temperature °C										
Wind Speed - meters/second	5	7	10	13	15	18	21	24	27	29	32
	Time in Minutes										
0	5	5	5	5	5	5	5	5	5	5	5
3	5	5	5	5	5	5	5	5	5	5	5
5	6	5	5	5	5	5	5	5	5	5	5
7	7	7	6	6	5	5	5	5	5	5	5
9	8	7	7	6	5	5	5	5	5	5	5
11	10	9	8	7	6	6	5	5	5	5	5
13	12	11	10	9	8	7	6	5	5	5	5

Note: Low temperatures combined with high wind (> 7 m/s) may require additional insulation or wind block to maintain blanket temperature.

Note: Tables assume blanket temperature of 126-129°C.

Appendix E Dura-Grip™ Walk Surface Application

TOP COAT APPLICATION WINDOW

Dura-Grip™ top coat should be applied the same day as the contact adhesive and grit. If same day top coat application is not possible, the top coat can be applied up to 5 days after contact adhesive and grit if the following conditions are met:

a. The adhesive and grit shall be tightly wrapped with shrink wrap to keep surface clean from dirt, debris, and moisture. Shrink wrap must be applied the same day as the contact adhesive and grit, but only after the contact adhesive is fully dried.

b. Shrink wrap must be applied from cable low point to cable high point with a 6 inch minimum overlap to prevent dust build up and avoid water intrusion.

c. Shrink wrap shall be sealed by tapping or other means at the high and low point to keep water out and to prevent the wrap from coming lose. There should be no visible holes in the wrap.

d. After removing the shrink wrap and prior to applying the top coat, verify that the surface is dry and free from dust or dirt. Verify proper conditions for top coat installation as outlined on sheet 17 of this manual, and clean edges of the walk surface thoroughly with xylene.

e. Document the section of the cable on which the walk surface top coat was not installed the same day as the contact adhesive and grit. Record the date of contact adhesive and grit application, cable ID number, and verification that shrink wrap was applied. When the top coat is applied record date, ambient temperature, and dew point or RH.

Top Coat Curing Schedule

Surface Temp	Dry to Handle/Recoat	Final Cure
40°F	24 Hours	28 Days
50°F	15 Hours	14 Days
75°F	6 Hours	7 Days
90°F	3 Hours	4 Days

Table 1

Walk Surface Coverage and Application Rates

Walk surface width inch (mm)	Coverage ft²/ft (m²/m)	LFT/gallon (LM/liter)	Lb grit/LFT* (grams grit/LM)
5.91 (150)	0.49 (0.046)	203 (16.35)	0.09 (134)
7.87 (200)	0.66 (0.061)	152 (12.24)	0.12 (179)
9.84 (250)	0.82 (0.076)	122 (9.82)	0.15 (223)
11.81 (300)	0.98 (0.091)	102 (8.21)	0.18 (268)
13.78 (350)	1.15 (0.107)	87 (7.00)	0.21 (313)
15.75 (400)	1.31 (0.122)	76 (6.12)	0.24 (357)
19.69 (500)	1.64 (0.152)	61 (4.91)	0.30 (447)
23.62 (600)	1.97 (0.183)	51 (4.11)	0.35 (521)

Table 2

*Lbs of grit applied at 0.18 lb/ft^2

Appendix F Weather Considerations

Cableguard™ should not be installed in foul weather (precipitation) as it can affect the material's ability to bond. Foul weather may prevent completion of wrapping, heating, and/or finishing works on a single panel or series of panels. The procedures outlined below should be followed in the event of foul weather. Effort should be made to complete works on unheated panels as soon as possible.

FOUL WEATHER PROCEDURES FOR WRAPPING WORKS

In the event of foul weather during wrapping works, wrapping should be stopped and the loose end of the Cableguard™ wrap should be properly secured. Cable bands should be sealed to prevent water from accumulating in the clamp recess and penetrating between the unbonded layers of Cableguard™ material. The upper cable band and all unheated wrap should then be covered in plastic shrink wrap to prevent moisture from penetrating between the unbonded layers of Cableguard™ wrap. The shrink wrap should be applied from the bottom of the cable with at least a 30% overlap.

FOUL WEATHER PROCEDURES FOR HEATING WORKS

In the event of foul weather during heating works, heating should be stopped and the loose end of the Cableguard™ wrap located at the lower cable band should be heat sealed (tacked in place) using a heat gun and stitching roller. Upper and lower cable bands should be sealed to prevent water from accumulating in the clamp recess and penetrating between the unbonded layers of Cableguard™ material if finishing work has not yet been completed in those locations. The unfinished cable bands and unheated portion of the wrapped panel should be covered in plastic shrink wrap to prevent moisture from penetrating between the unbonded layers of Cableguard™ wrap. The shrink wrap should be applied from the bottom of the cable with at least a 30% overlap.

FOUL WEATHER PROCEDURES FOR FINISHING WORKS

In the event of foul weather during finishing works, finishing work should be stopped and the cable bands should be sealed to prevent water from accumulating in the clamp recess and penetrating between the Cableguard™ material and the cable. Unfinished cable bands and the first meter of wrap from the unfinished band should then be covered in plastic shrink wrap to prevent moisture from penetrating between the unbonded layers of Cableguard™ wrap.

PROCEDURE FOR LEAVING WRAPPED PANELS UNHEATED

Wrapped panels may be left unheated overnight and for periods longer than 24 hours by following the procedures outlined above for foul weather work. Effort should be made to complete works on unheated panels as soon as possible to ensure a proper bond between layers of Cableguard™ material.

INSTALLATION TEMPERATURES FOR CABLEGUARD™ AND ADHESIVES

Wrapping works may be undertaken in ambient temperatures below 5°C with no additional considerations provided the material is dry. Heating works may also be undertaken in temperatures below 5°C so long as attention is given to adjusting blanket temperature and/or cycle time to attain acceptable bonding. Special consideration must be given when installing the following components at temperatures below 5°C:

- D.S. Brown part 45-121 (Aron-Alpha “Super Glue”) can be used in temperatures as low as -17°C to adhere neoprene system components. Set or cure time for the adhesive is increased as the temperature falls. For example, while cure time at 10°C and 50% relative humidity is 7 seconds, cure time at -17°C and 50% relative humidity could be as long as 60 seconds. A spray-on accelerator (part 45-122) may be used to speed up set time in any conditions.