BRIDGESTONE RUBBER DAM INSTALLATION

GUIDE – 3

RUBBER DAM BODY

OF

SINGLE ANCHOR LINE

BRIDGESTONE CORPORATION

Revision List

No	Page	Content	Date	P.I.C
0	-	Original Issue	Dec. 96	BSY
1	36	Use SC 2000. Size, Qty, Spacer, Fig5-2-b.	May 98	Kusunose
2	10	Lifting Tool-3, Change Design.	Jan. 99	Kusunose
3	25, 27	Mis-spelling	8 Oct. 99	Kusunose
4	31,32	Change method Wave Spacer install	2 Oct. 00	Kusunose
5	All	Re-phrasing and update data	2 Sept. 02	CharHwee
6	-	Adjust to Tempe Replacement Dam	28 May.09	H.Akiyama

SECTION - 1

UNROLLING THE RUBBER DAM BODY

The following steps outline a recommended method for unrolling the rubber dam body.

It may be helpful to describe the rubber dam body, its design, and how it will appear when unrolled before outlining the steps in this guide.

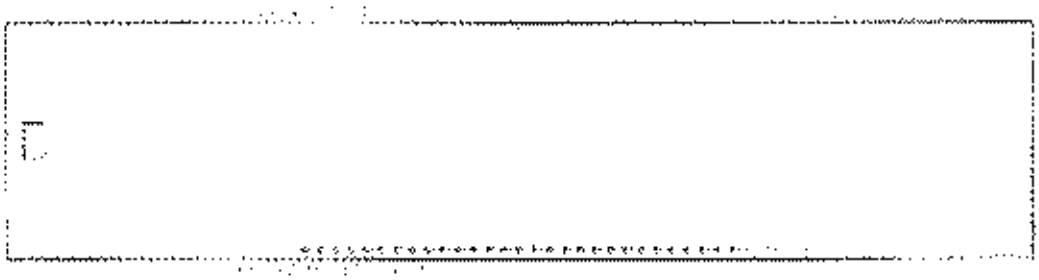


Fig. 1-a : Plan View Of Rubber Body When Unrolled

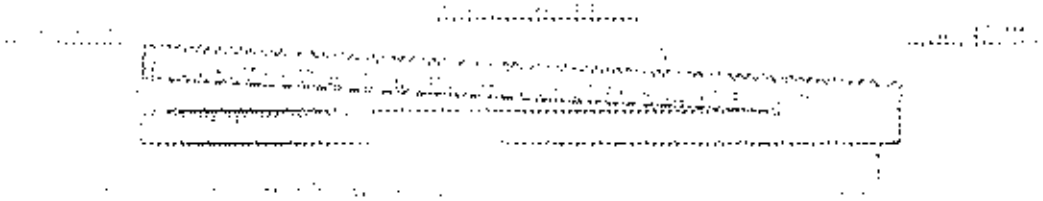


Fig. 1-b : Cross Section Of Rubber Body

Important : 1. All lifting tools described in this guide are not supplied by Bridgestone.
2. Lifting tools detail design and final construction dimensions is by contractor.

When unrolled, the rubber body is rectangle shape, although once cut on site, the actual shape will be as indicated by the dotted lines on both ends as shown in Fig. 1-a.

Holes are pre-drilled for the anchor bolts in the riverbed foundation. Holes for anchoring to the side slopes not pre-drilled at the factory and must be completed in the field.

A section of fabric is removed at the factory to provide a "core" sample for various quality control tests for lamination, adhesion, uniformity, etc. When manufactured the rubber dam body has its outer surface textured and the inner side is smooth. This textured side will face up as the rubber body is rolled onto the foundation.

Note : It is best recommended to have Bridgestone advisor during rubber body installation

Safety Notes

The rubber dam is a long-lasting water control system. The nylon reinforced rubber compound is resilient, flexible and durable.
Even so, attention must be paid to how it is handled during installation.

The biggest concerns with protecting the rubber dam body are:
- Debris on foundation and embedded plates when rubber body is unrolled.

- Damage from tools either under the rubber body or laying on top of the body being pushed into it.

- Unsuitable machinery driven onto the rubber body.

- Welding torches damaging the rubber.

- Improper lifting of the rubber body by crane.

- Dropping heavy or sharp objects on the fabric.

- Contamination by oil or grease (especially fatty acids).

1 - 1. PREPARATION WORKS

Prior to unrolling the rubber dam body, air blow to clean whole foundation and fixings surface free from particles. Then apply silicone sealant again onto the protection embedded plates as shown in Fig. 1-1-a below.

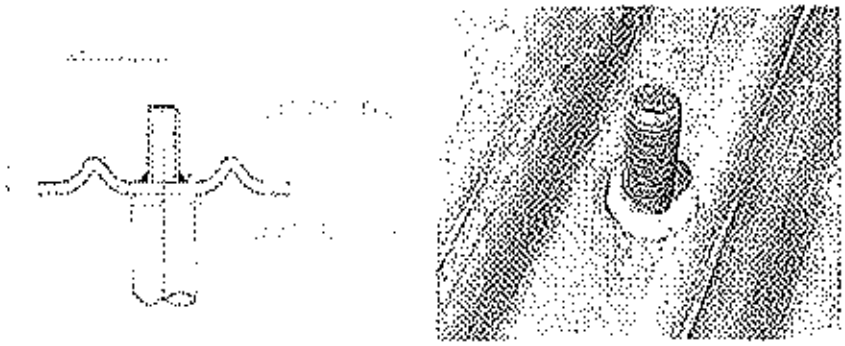


Fig. 1-1-a : Apply Silicone Sealant.

Once the silicone sealant has cured, set the rib packing over the anchor bolt as shown in Fig. 1-1-b below. Ensure no particles on fixing surface, especially under the rib packing.

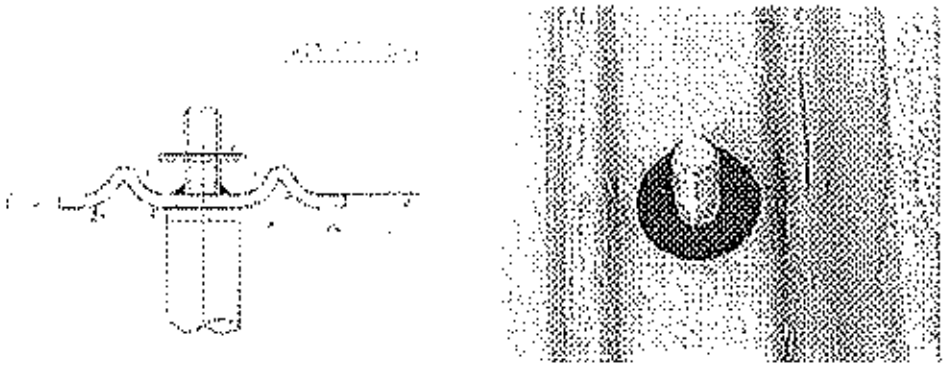


Fig. 1-1-b : Apply Rib Packing

1 - 2. SET RUBBER BODY LIFTING LINE

The rubber spool can be lifted using one of the following methods:

a. With a sling (Photo 1-2-a).
   The sling must be wide so as not to create much pressure on the rubber body when lifted.

b. With slings attached to a pipe installed through the spool (Photo 1-2-b).

c. With a spreader bar (Photo 1-2-c) and either clamps attached to the side of the drum spindle.
   This method is recommended for unrolling the rubber body on the foundation.
   (Refer to Lifting Tools 1, 2, 3 and 4 in following pages).

Lift the rubber body and place on riverbed foundation. Watch that it is placed on the foundation with the open end facing upstream (see Fig. 1-b "Cross Section of Rubber Body") and textured side facing up. The rubber body should be positioned near the side slope from which it will be unrolled.

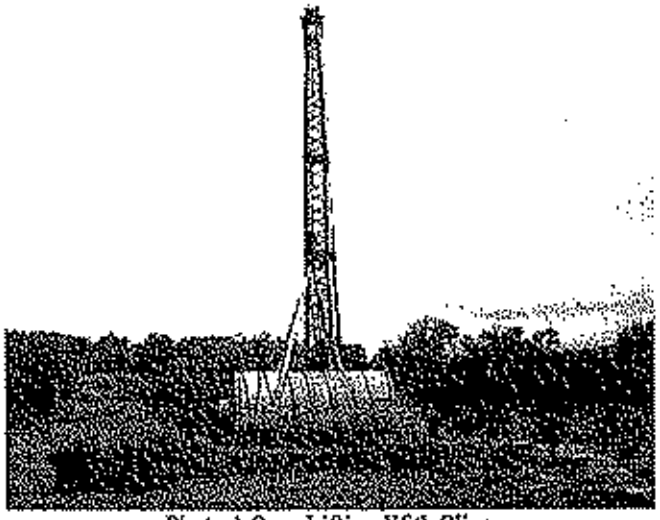


Photo 1-2-a : Lifting With Sling

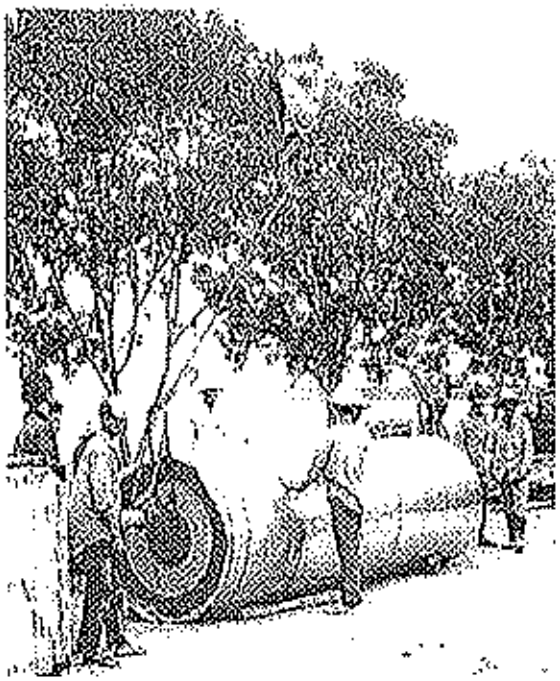


Photo 1-2-b : Lifting With Sling Attached To A Pipe

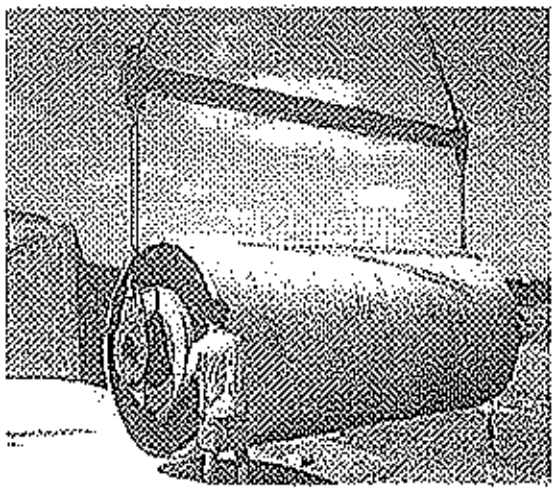
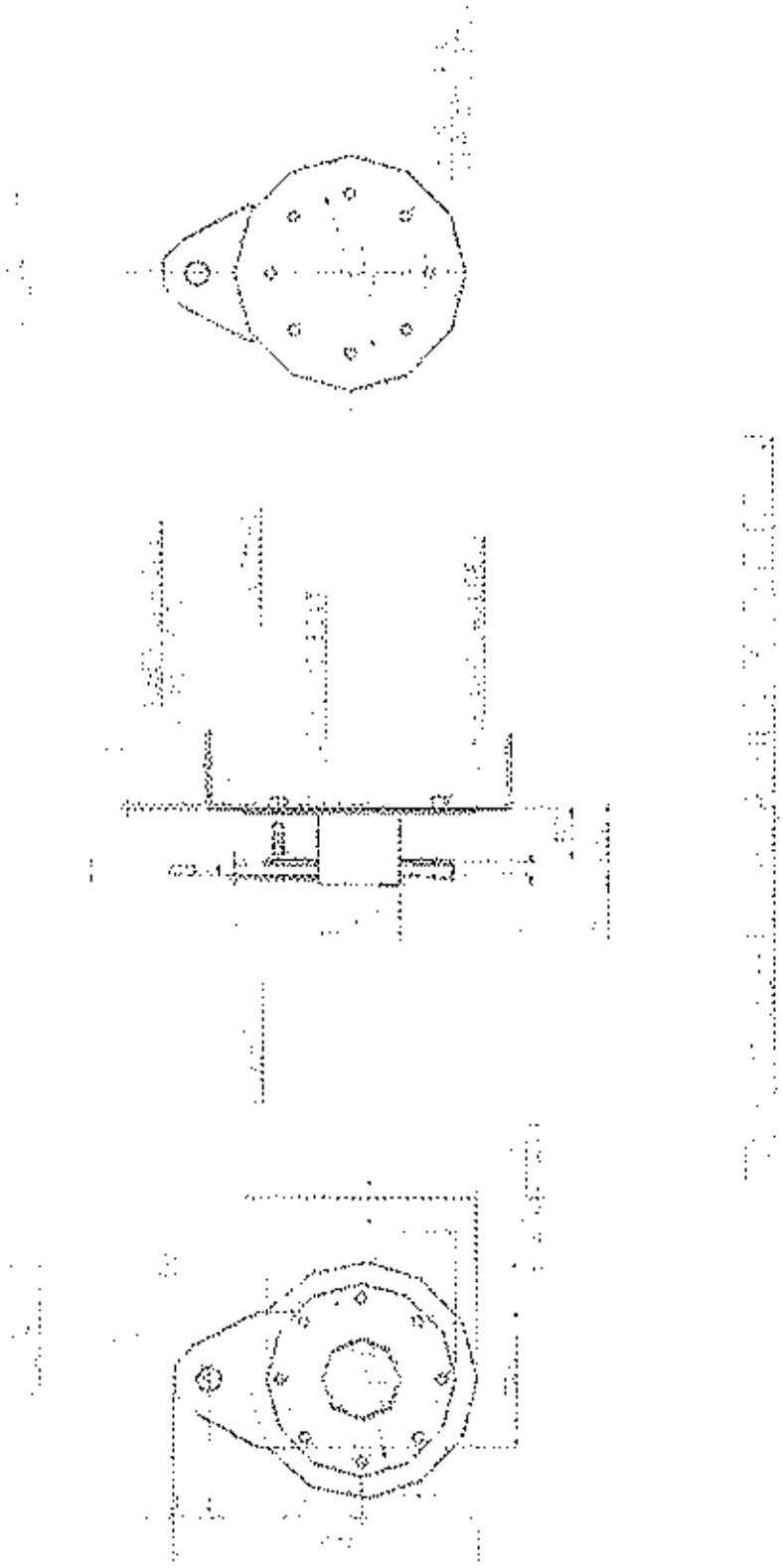


Photo 1-2-c : Lifting With Spreader Bar



Lifting Tool -1: Attached To The Drum

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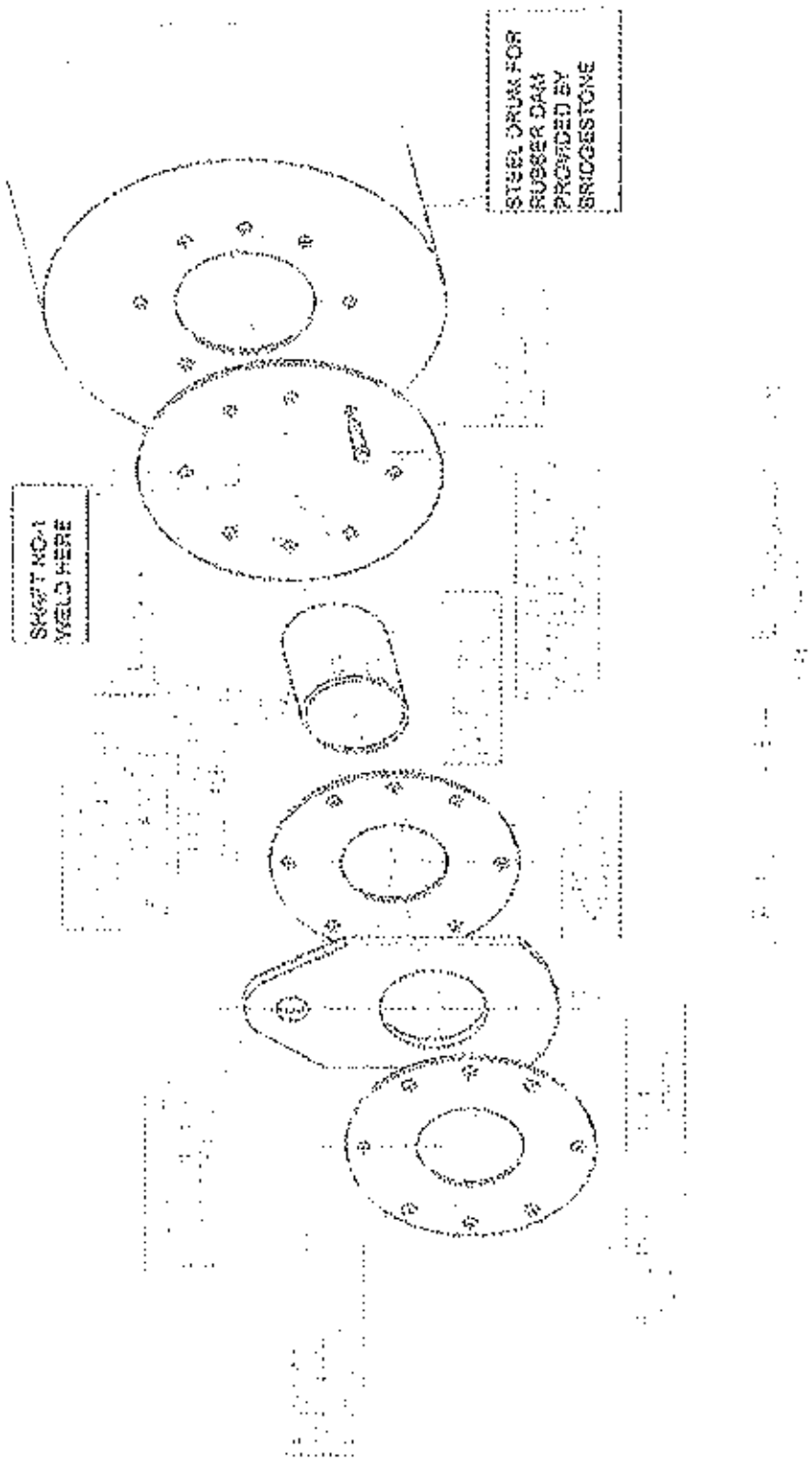
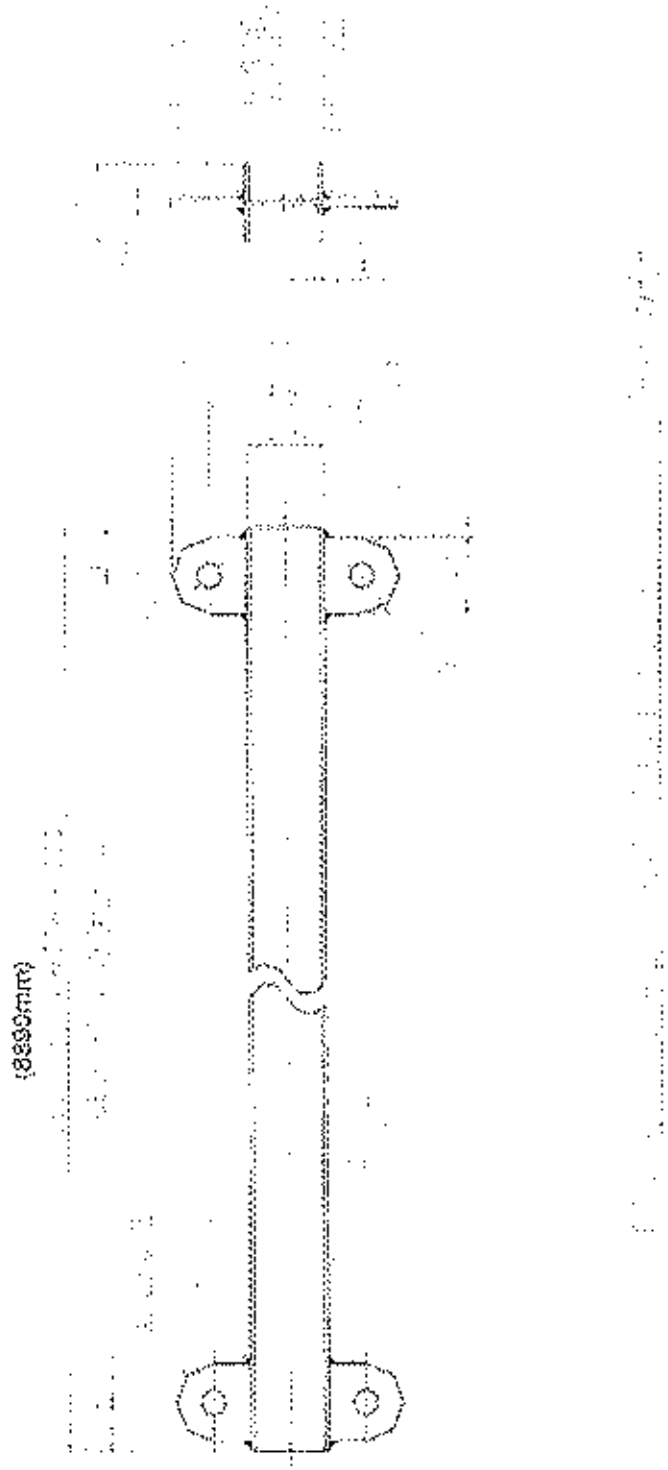


Lifting Tool -1: Exploded View

[1st Issue : 12 / 96] [Revised : 09 / 05]



Lifting Tool -2 : Spreader Bar

[1st Issue : 12 / 96] [Revised : 09 / 05]

1 - 3. PARTIALLY UNROLL RUBBER BODY

Confirm that the correct end of the rubber dam body is facing upstream before unrolling (Photo. 1-3-a) and that the area on which the rubber body will be unrolled is clear of tools and debris.

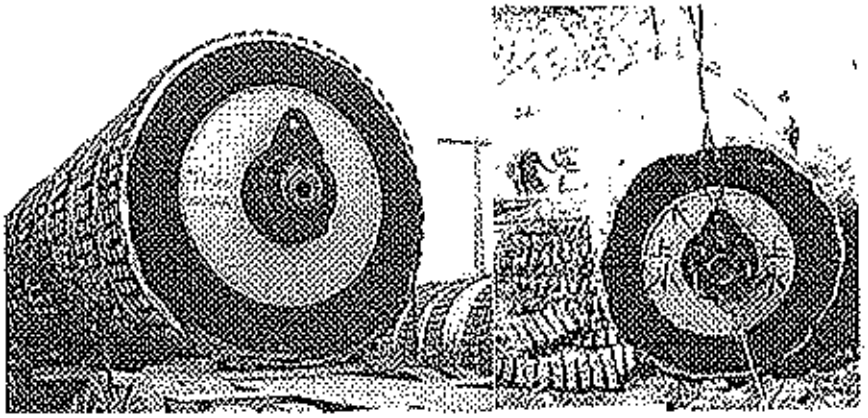


Photo 1-3-a : Marking Upstream Side Of Rubber Body And End Of Fin

Unroll the rubber body until the first anchor bolt holes appear. At this point there is a sheet of paper indicating which anchor the hole should be placed on. Retain this paper for Step 1-5. The rough side of the rubber body should face up.

Unrolling can be done in one of the three following ways:

a. With manpower, especially for small dams (Photo. 1-3-b).

b. Manpower assisted by a small vehicle, such as a forklift (Photo. 1-3-c). Before a vehicle is permitted to drive on the rubber body its tires must be inspected to insure that they do not have hard material embedded in them. The part of the vehicle contacting the rubber body must be such that it will not cause damage to the fabric.

c. A crane lifting the rubber body drum with a spreader bar and cables to the spindle (Photo. 1-3-d). This is the preferred method, especially for large rubber dams.

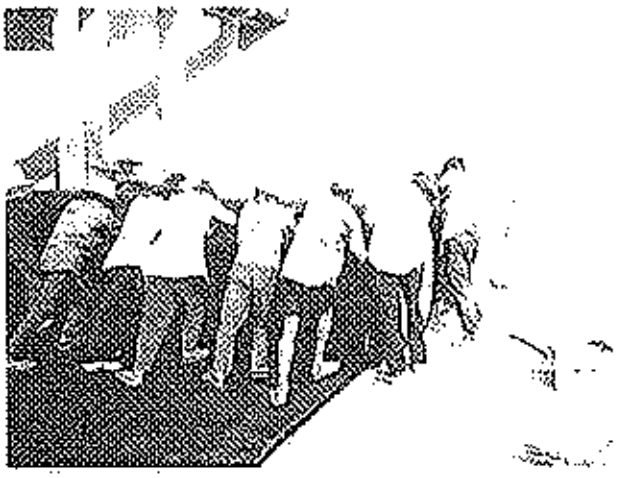


Photo 1-3-b : Manpower Assisting Rubber Body Unrolling

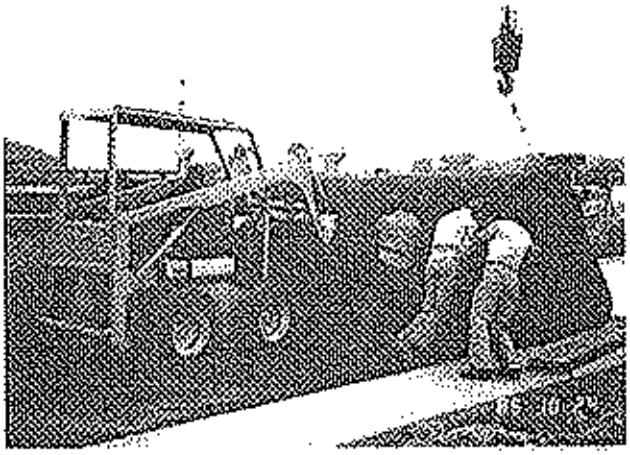


Photo 1-3-c : Small Vehicle Assisting Rubber Body Unrolling

Photo 1-3-d : Crane Assisting Rubber Body Unrolling

1 - 4. DRILL HOLES IN END OF RUBBER BODY FOR LIFTING TOOL - 3

Drill holes of about the same diameter as the anchor bolts for attachment of the lifting tool - 3 (see Fig. 1-4). The holes should be about 300mm (12") from the end of the rubber body, as shown in Fig.1-3-a below. The hole spacing must match that of the lifting tool – 3.

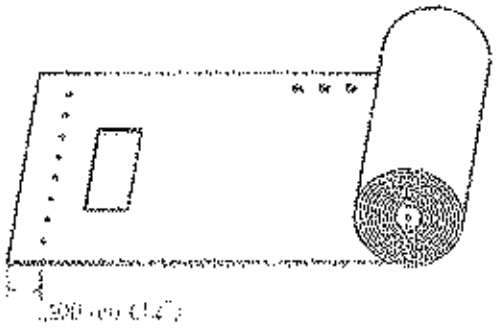


Fig. 1-4 : Location Of Lifting Tool - 3 Holes In The End Of Rubber Body

1 - 5. ATTACH LIFTING TOOL - 3 TO THE RUBBER BODY

Install Lifting Tool - 3 on both sides of the rubber body with heavy bolts as illustrated in Photo 1-5-a., Photo 1-5-b. The bolts must be tight to compress the rubber to avoid tearing during lifting operation. Hole spacing should be 2 x anchor bolt spacing (i.e 300mm or 400mm) on embedded plate.

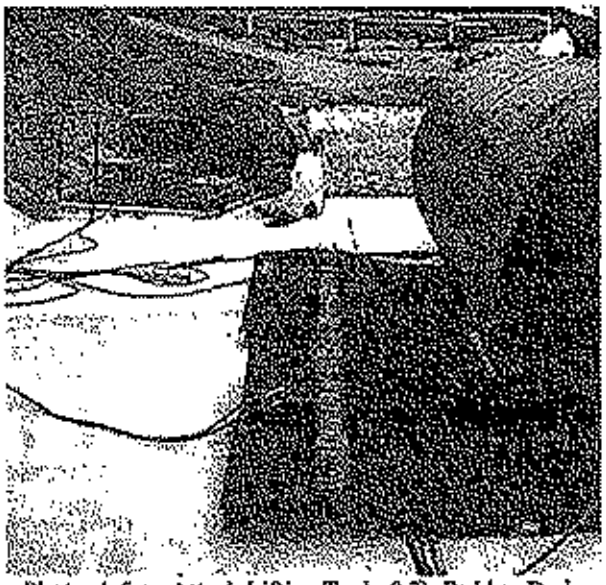


Photo: 1-5-a : Attach Lifting Tool - 3 To Rubber Body

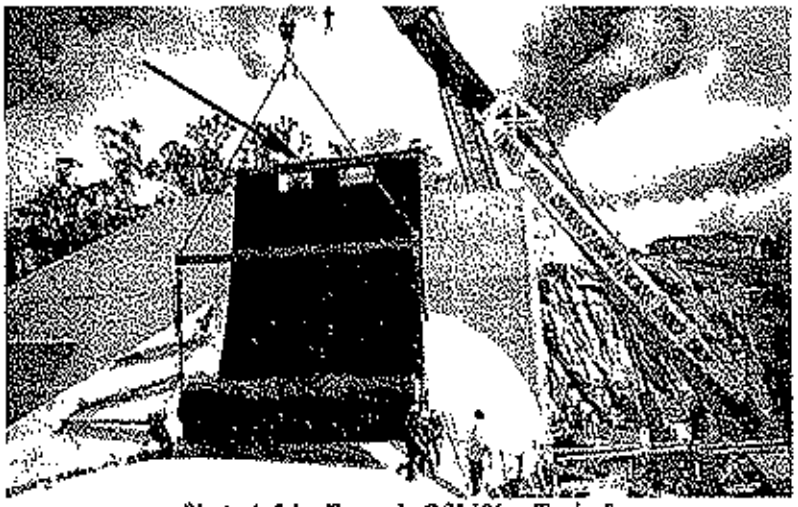
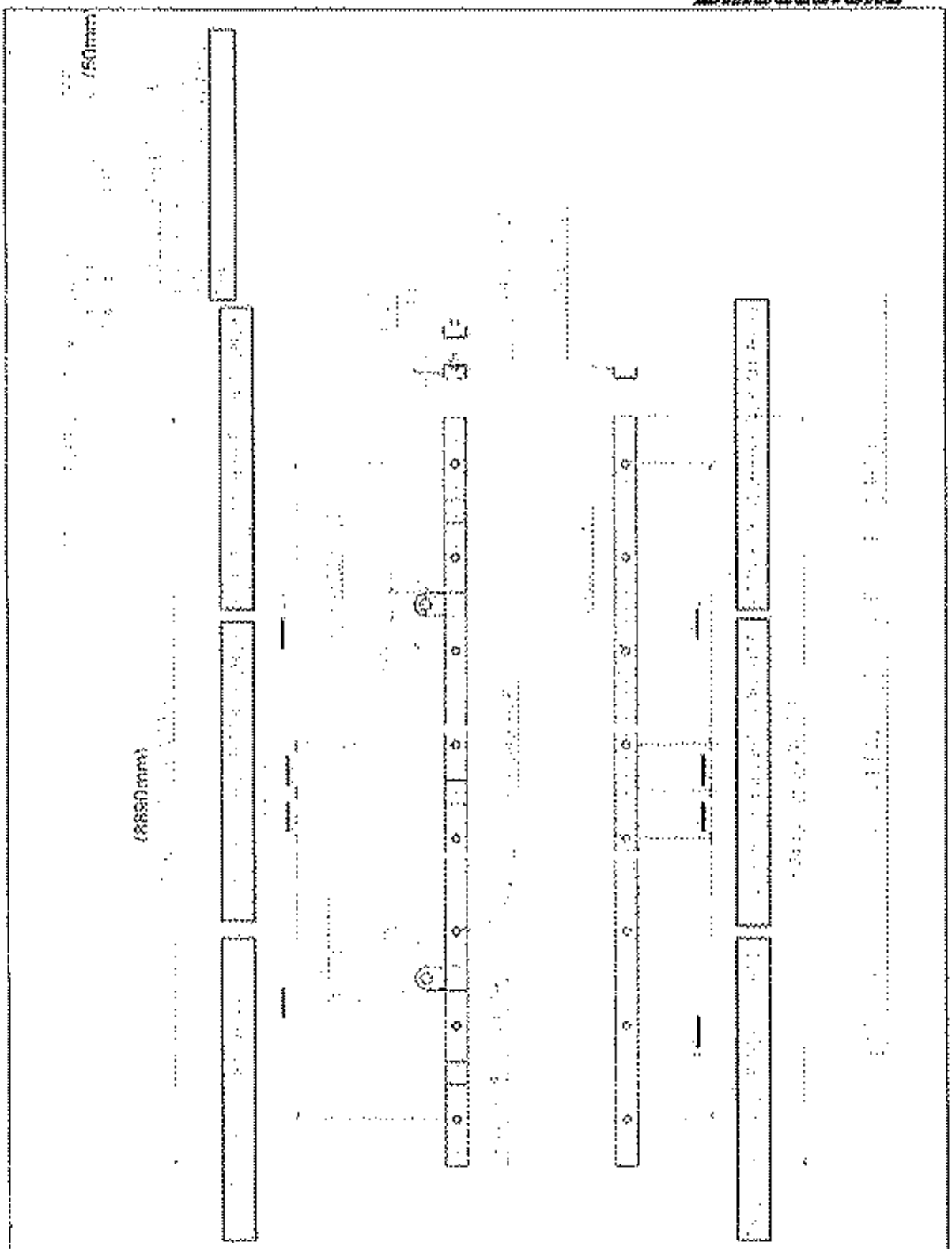


Photo 1-5-b : Example Of Lifting Tool - 3



Lifting Tool -3 : Attached To The Rubber Body End

[1st Issue : 12 / 96] [Revised : 09 / 05]

1 - 6. POSITION FIRST ANCHOR BOLT HOLE IN RUBBER BODY

Attach cables to Lifting Tool -3 and pull rubber body end up the side slope while simultaneously lifting the spool using the crane. Position the rubber body so that the first factory hole is over the designated anchor bolt.

If the paper says "7", you should place the first hole in the rubber body on the 7th anchor bolt (counting from side slope), as shown in Fig. 1-6-b. Lower the rubber body while placing several of its anchor bolt holes over the correct anchor bolts in the riverbed foundation.

NOTE: The weight of the rubber body and its shape can create a lot of drag.
Care should be taken to observe that wind conditions on site are suitable for this task.

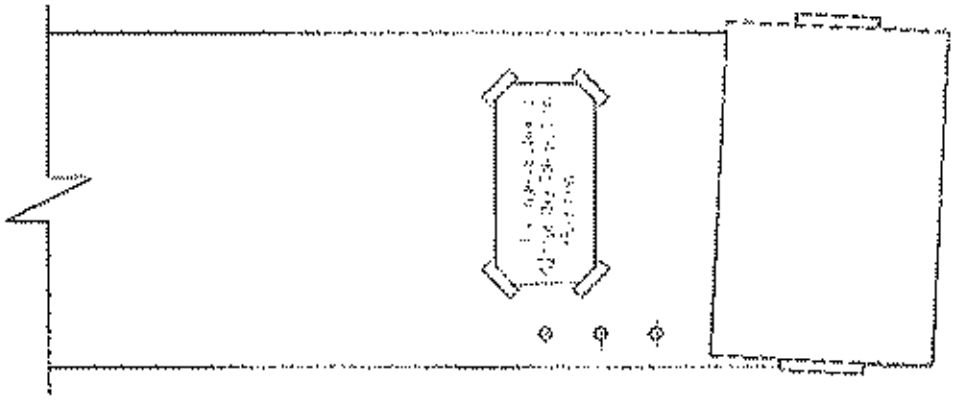


Fig. 1-6-a : Paper In Rubber Body With Position Of First Anchor Bolt Hole

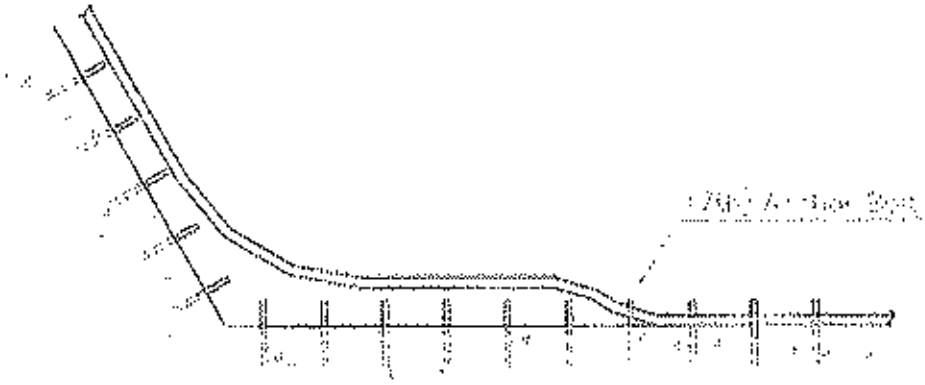


Fig. 1-6-b : Position First Pre-Drilled Anchor Bolt Hole

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1 - 7. UNROLL RUBBER BODY

By using crane, unroll the entire length of the rubber dam body on the riverbed foundation while pushing (e.g. kicking with foot) the pre-drilled anchor bolt holes over the anchor bolts. Unrolling may become difficult if slack develops in the rubber body drum (Fig. 1-7-a). If this happens it is helpful to lift the drum and move it forward to take the slack out.

Keep the rubber spool very close to the foundation while unrolling. If the spool starts to unwind uncontrollably, immediately lower rubber spool onto foundation. Completely unroll rubber body, being sure to tread every factory hole over its respective anchor bolt.

After unrolling, the drum can be disconnected from the rubber body and put to one side.

Fig. 1-7-a : Slack from Unrolling Rubber Body Drum

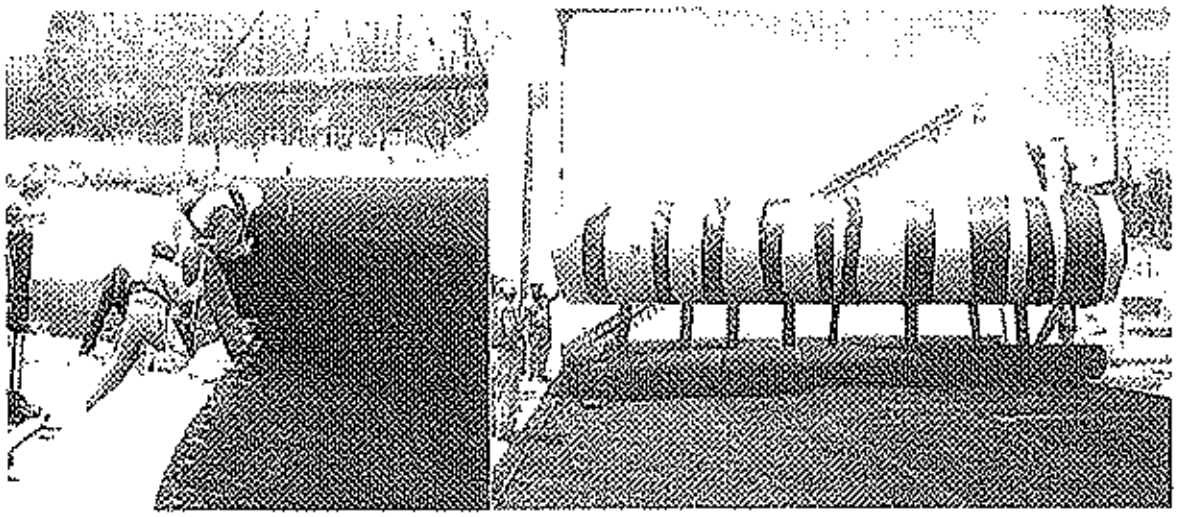

Fig. 1-7-b : Pushing The Pre-drilled Holes, End Of Unrolling.

SECTION - 2

DRILLING ANCHOR BOLT HOLES IN THE RUBBER BODY

Because of construction tolerances at the site, not all anchor bolt holes are pre-drilled in the rubber dam body. Some will have to be drilled on site. The holes which will need to be drilled *in the field* are for the side slope anchor bolts and usually the first 5-7 anchor bolts on the riverbed foundation. The procedures for determining the position of these holes and drilling them are outlined in this section.

2 - 1. MARK RIVERBED FOUNDATION ANCHOR BOLT HOLES

The anchor bolts on the riverbed foundation near the side slope are not spaced at regular intervals like the anchor bolts along the riverbed foundation. To determine the correct position for drilling these holes, measure the actual distance between the anchor bolts and mark them on the rubber body.

As the correct placement of these holes is critical, confirm accuracy of the marks on the rubber body against the actual anchor bolt positions. Place wood under the marked locations and drill holes with the drill bit provided by Bridgestone (Photo 2-1-a).

After drilling the 5 – 7 holes for the invert anchor bolts, tread the rubber body down over the anchor bolts (Photo 2-1-b).

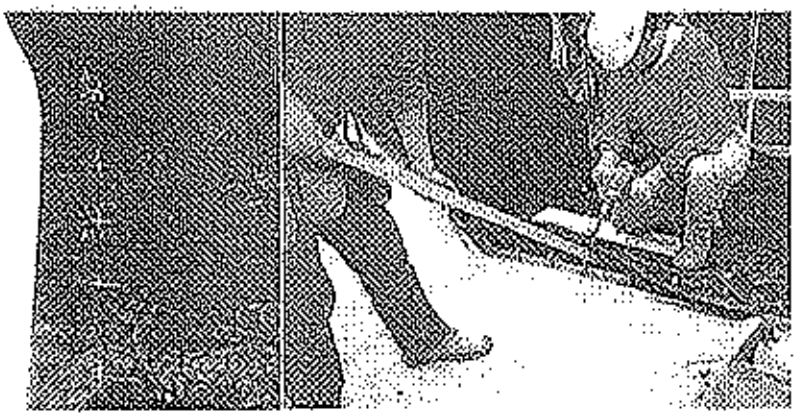

Fig. 2-1-a : Marking And Drilling Bolt Holes Near Side Slope.

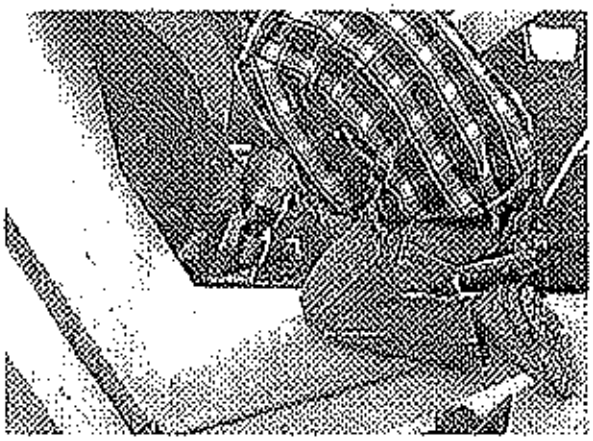

Fig. 2-1-b : Tread The Rubber Body Down The Invert Bolts

2 - 2. MARK FIRST SIDE SLOPE ANCHOR BOLT HOLE

The required drill dimension and position of the first anchor bolt hole on side slope depends on the;

a. side slope angle of the abutment
b. thickness of rubber body
c. protrusion of anchor bolt
d. stiffness of rubber body

A special calculation, site adjustment and experience are necessary for determining the position of the first anchor bolt hole on the side slope. **Hence a Bridgestone advisor is recommended to attend this work.**

In case a Bridgestone advisor is not at site, refer to Table 2-2-a below as reference. Select the suitable or its closest equivalent to determine the length to be subtracted from the measurements indicated in Fig. 2-2-b.

Slope (V:H)	1 : 2.0	1 : 1.5	1 : 1.0	1 : 0.5	1 : 0.3	1 : 0.0
γ	10 mm (3/8")	15 mm (5/8")	20 mm (6/8")	30 mm (1-1/8")	40 mm (1-5/8")	45 mm (1-6/8")

Table 2-2-a : Subtracted Distance For First Side Slope Anchor Bolt Hole

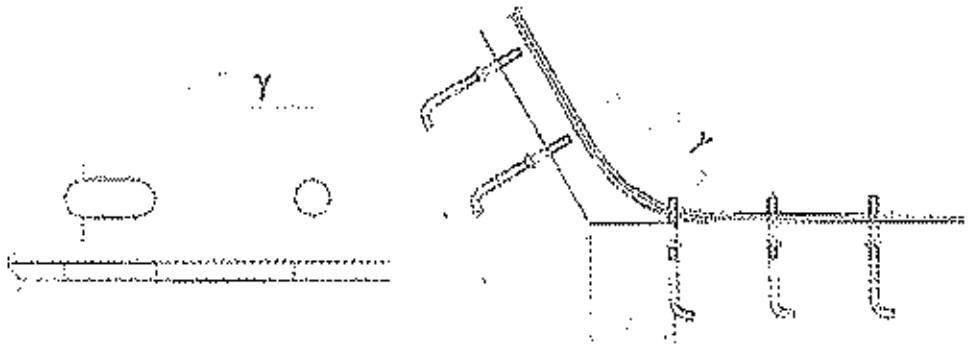

Fig. 2-2-b : Mark Position For First Side Slope Anchor Bolt Hole

where:

A = Distance from the center of the anchor bolt in the riverbed foundation to the side slope corner.
B = Distance from the center of the anchor bolt in the side slope foundation to the side slope corner.
γ = Subtracted distance provided in Table 2-2-a above.

2 - 3. FIRST DRILLING OF ANCHOR BOLT HOLES ON SIDE SLOPE

Similar with Step 2-1.
Place the wood underneath area of rubber to be drilled for protection.

Using the drill bit provided by Bridgestone, drill the first side slope anchor bolt hole marked in Step 2-2. This hole must be oblong, twice the diameter of the hole in length, with the length going up the side slope (see Fig. 2-2-b).

2 - 4. CHECK POSITION OF SIDE SLOPE OF RUBBER BODY

Place anchor bolt holes drilled in Step 2-3 over anchor bolts. Confirm that the rubber body lays flat on the riverbed foundation and that there is no sag or slack at the corner between the side slope and the riverbed foundation. The rubber body should rest naturally at this position, without the use of pushing or kicking to force it to follow the contour of the corner between the side slope and the riverbed foundation.

Photo 2-4 shows the corner section of a rubber dam body going up a steep side slope (V:H = 1:0.225). The more gradual the side slope, the more the rubber body can adhere to the change in angle of the foundation between the side slope and the riverbed foundation.

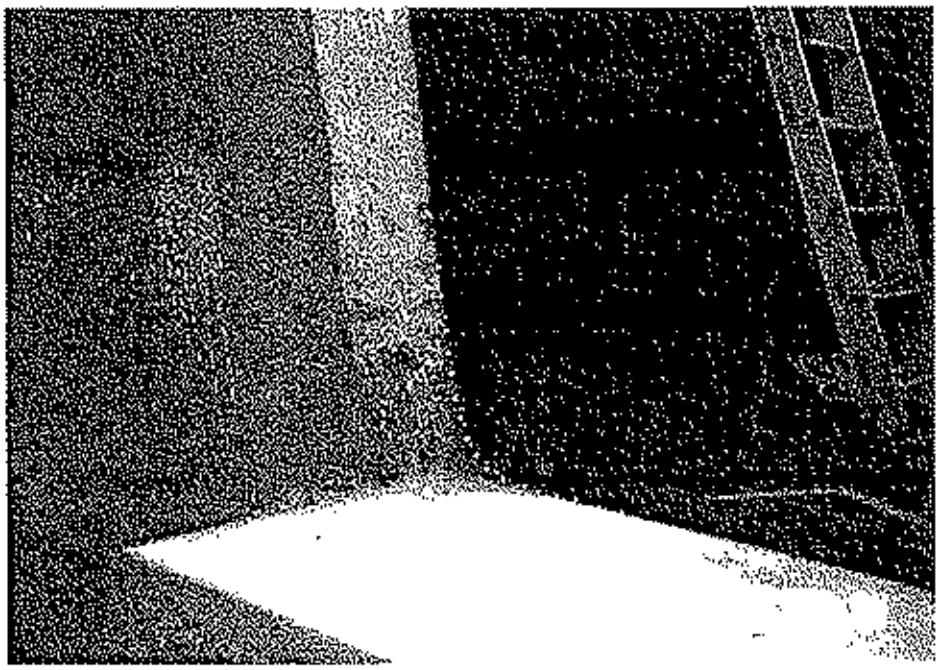

Photo 2-4 : Proper Position Of Rubber Body On Side Slope

2 - 5. MARK DRILLING POSITION IN SIDE SLOPE OF RUBBER BODY

Install a single clamping plate (or with pieces of steel plates) on the portion of the rubber body adjacent to the side slope. Photo 2-5-a shows an abutment with fillet concrete.

Once the position of the side slope portion of the rubber body has been determined to be in accordance with Step 2-4, the position of anchor bolt holes which need to be drilled can be marked.

This is done by creating an impression on the back side of the rubber body by hitting it with a steel sledge hammer where anchor bolts are positioned underneath it (Photo 2-5-b).
Make an impression for all anchor bolts on the side slope.

Pull the rubber body off the side slope and lay it on the invert to expose the marked impressions. Place heavy timber under the impressions to protect the rubber body below.

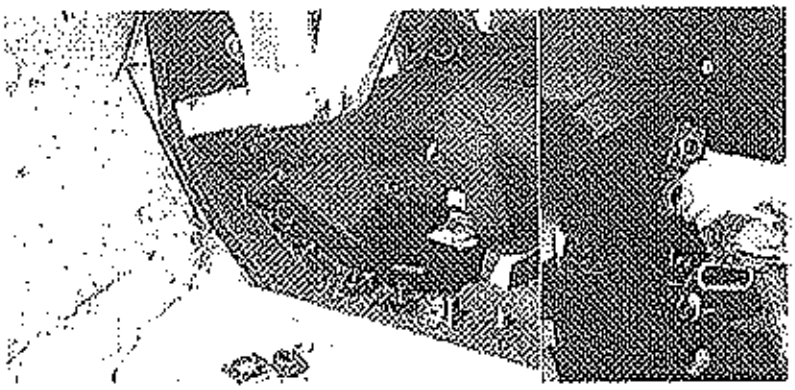

Photo 2-5-a : Clamp Down Rubber Body Adjacent To Side Slope

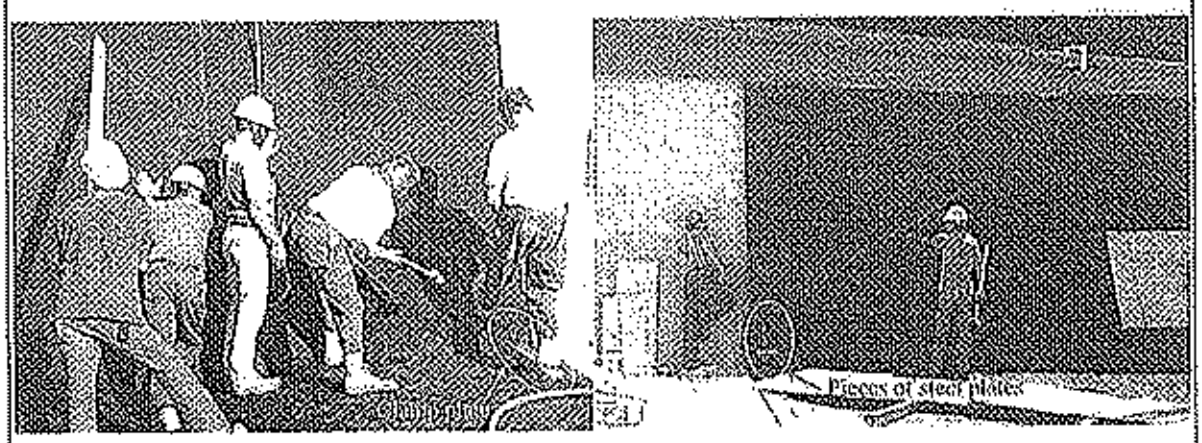

Fig. 2-5-b : Hit Side Slope Rubber Body With Sledge Hammer At Anchor Bolt Positions

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2 - 6. SECOND DRILLING OF ANCHOR BOLT HOLES

Mark the center point of the impressions found in the rubber body made in Step 2-5.
Drill anchor bolt holes using wood underneath area of rubber to be drilled for protection.
Return rubber body to side slope and place over all anchor bolts.

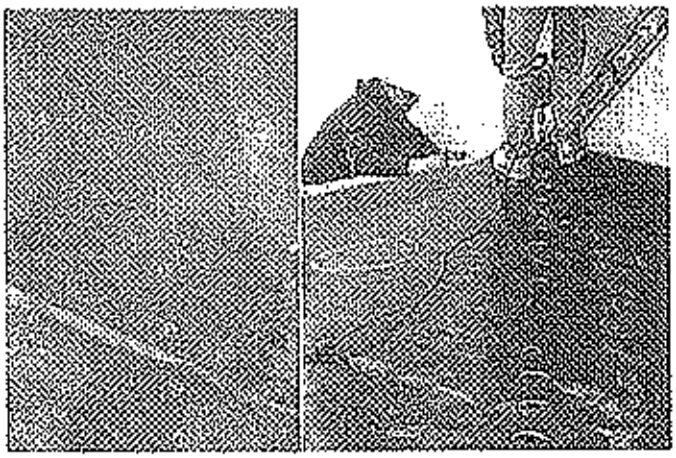

Fig. 2-6-a : Mark Impressions And Drill Holes In Rubber Body

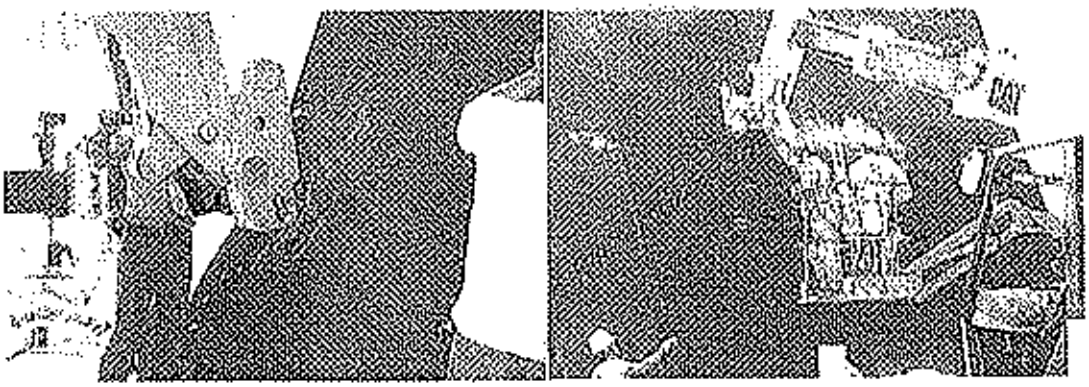

Fig. 2-6-b : Return Rubber Body To Side Slope

2 - 7. TRIM RUBBER BODY AT SIDE SLOPE POSITION

Trim the excess portion of the rubber body on the upstream side of the side slope. As shown in Fig. 2-7-a below, the distance between the anchor bolts and the cut line should be 25mm more on the side slope than on the riverbed foundation. Repeat sections 2-1 thru 2-7 on the other side slope. If it is planned to evaluate the aging of bladder after years, the 1500mm stream wise extra rubber would be helpful to take samples in future.

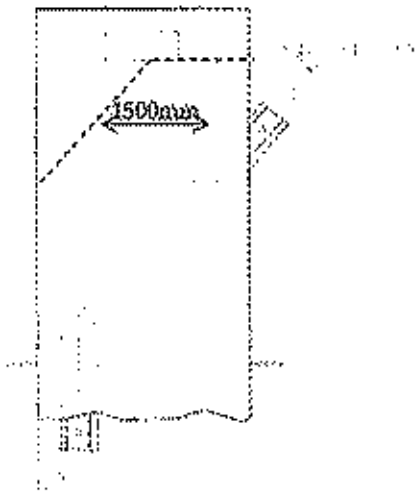

Fig. 2-7-a : Trim Rubber Body At Side Slope

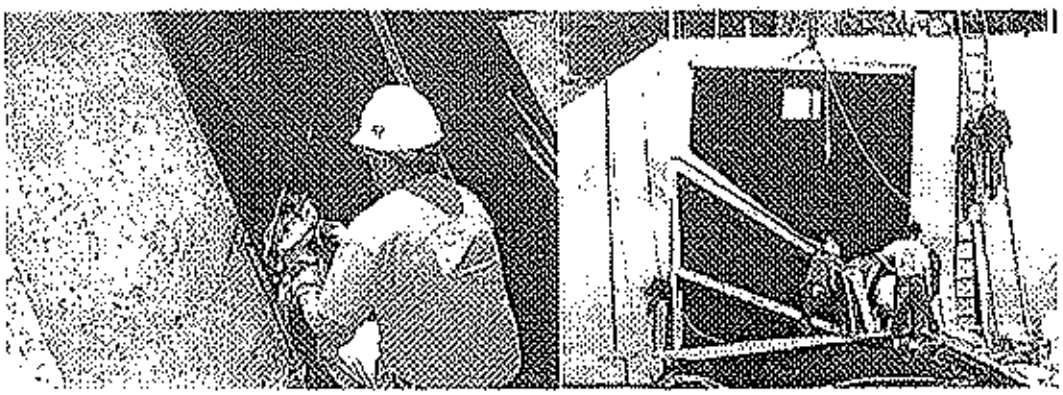

Photo 2-7-b : Trim Rubber Body Side Slope

2 - 8. DRILL HOLES FOR PROTECTION PLATES

After trimming excess rubber from the end of rubber dam body, remove clamping plate installed in Step 2-5 and pull back the top cover. Procedures to pull back upper layer is describe in Section 4. Find the location of the protection plate anchor bolts for the drain and air flanges.

Method 1 :
Similar to Step 2-5, make an impression in the rubber by hitting over the anchor bolts, using a sledge hammer.

Pull the bottom sheet down on the riverbed and drill the holes in bottom sheet for the protection plates after placing wood under rubber body to protect the other rubber body below.

Method 2 : (Unsuitable for very thick and stiff rubber body or wet condition)
Place a piece of wood on top of the anchor bolt and hit with a hammer.
An impression appears immediately on top of rubber body.
Mark the centre of the impression and drill directly using the drill bit supplied by Bridgestone.

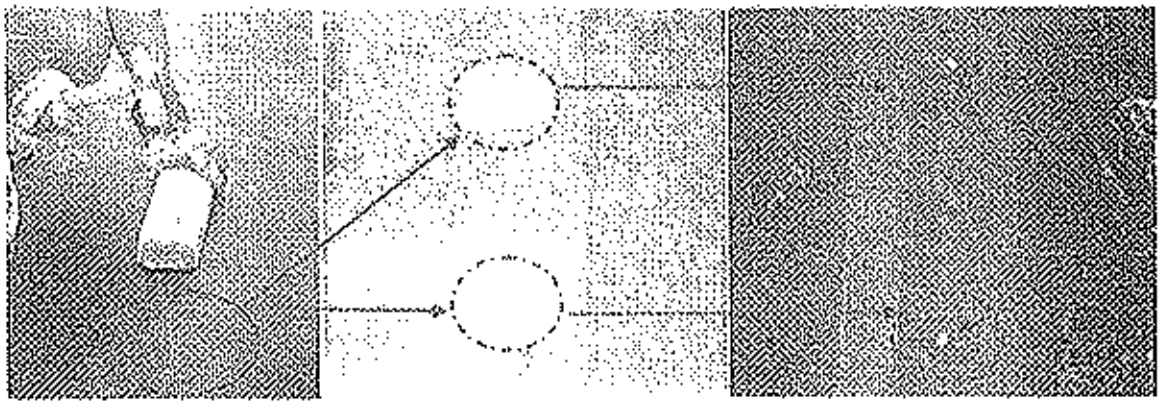

Photo 2-8 : Making Impressions In The Bottom Layer Of Rubber, Whitish Spots, Mark Center Point.

Method 3 : (Unsuitable for very thick and stiff rubber body)
Prior to unrolling rubber body, record down bolts as built position and mark its reference point.
Transfer as built positions to rubber body after top layer of rubber body is fully opened.

Procedures to pull back upper layer is describe in Section 4.

SECTION - 3

DRILLING HOLES FOR FLANGE CONNECTIONS

The air pipe and drain pipe are connected to the rubber dam body as outlined in this section. The rubber body must be opened before drilling for these pipes.

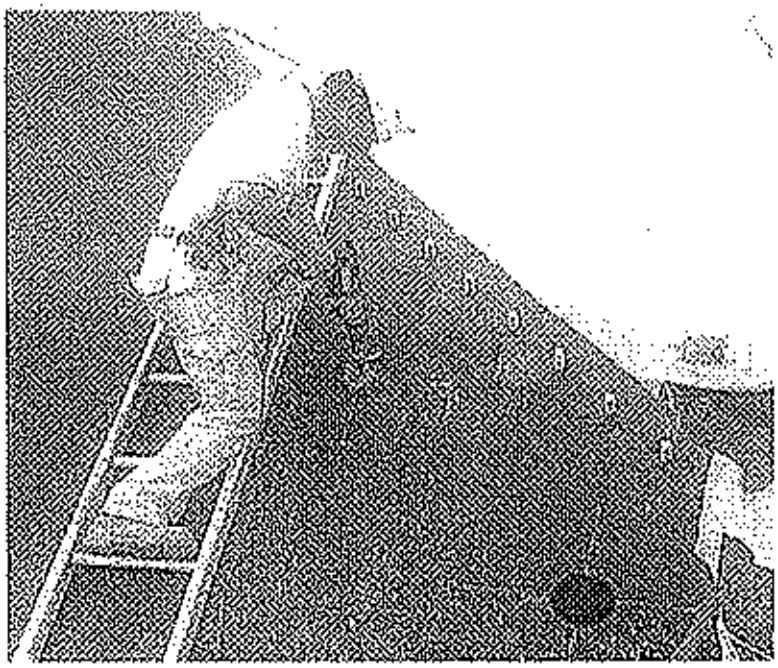

Photo 3 : Drill Hole For Flanges (After Transferring As Built Position)

3 - 1. CHALK PIPE FLANGES

Pull back both layers of the rubber body from the side slope where the air inlet-outlet, (air pressure inlet) and drain inlet are located. Rub chalk on the face of the flanges as shown in Fig. 3-1 below.

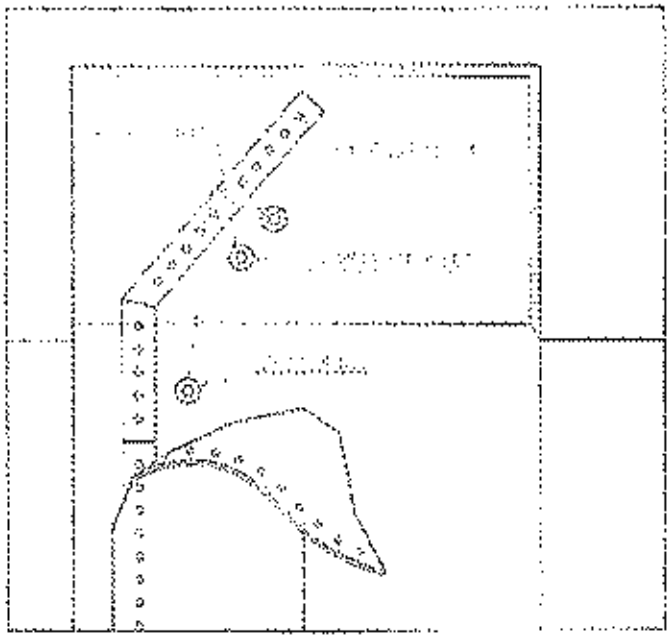

Fig. 3-1 : Chalk Pipe Flanges

3 - 2. STRIKE WITH MALLET TO MARK PIPE FLANGES

Return the rubber body over the anchor bolts and pull back the upper layer of the rubber body as shown in Fig. 3-2. This upper layer is pulled back to make marking the rubber body with the mallet easier and more accurate. Procedures to pull back upper layer is describe in Section 4.

Hit the rubber body with a mallet in the area where the flanges are located underneath, so that the chalk leaves a mark on the rubber.

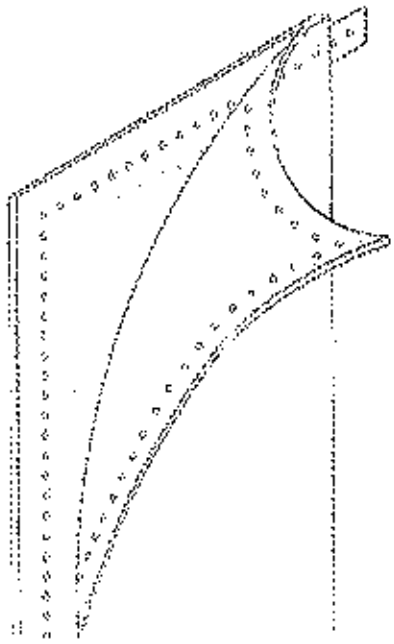

Fig. 3-2-a : Pull Back Upper Layer Of Rubber Body And Hit With Mallet

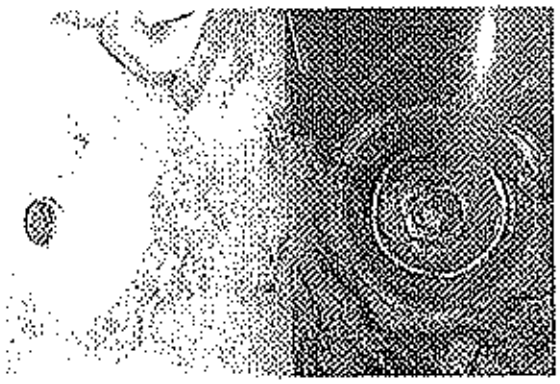

Fig. 3-2-b : Flange Impression On Bottom Layer Of Rubber Body

3 - 3. DRILL PIPE FLANGE POSITIONS

Pull back the rubber body from the side slope. The chalk rings on the foundation side of the rubber do not represent the pipe openings themselves but rather *the* ridges around the pipe flanges.

Locate the center of this ring, which represents the center of the pipe, as shown in Fig. 3-3-a.
Prior to drilling, place wood under the marked holes to protect the rubber body below.
Using this center mark, drill a hole of the same size diameter as the pipe, detailed in the drawings, with the special drill bit supplied by Bridgestone.

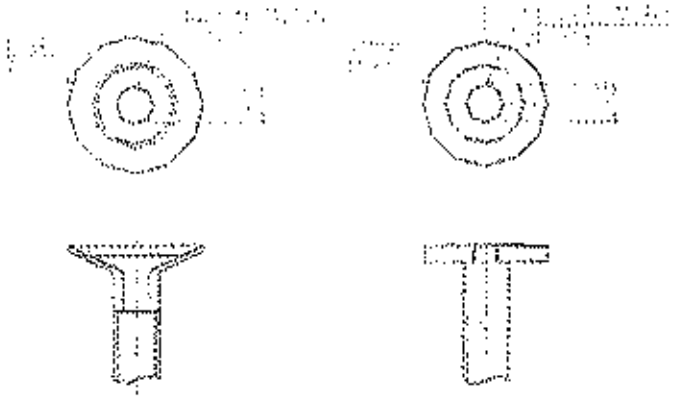

Fig. 3-3-a : Identify Center And Cut

TYPE \ SIZE	50A	80A	100A	150A	200A
Air Pipe	ϕ51±2	ϕ79±2	ϕ103±2	ϕ153±2	ϕ203±2
Drain Pipe	ϕ53±2	N/A	N/A	N/A	N/A

Fig. 3-3-b : Size Of Hole (mm)

Note : (Unsuitable for very thick and stiff rubber body)
Alternative to Steps 3-1 to 3-3;
Prior to unrolling rubber body, record down flanges as built position and mark its reference point.
Transfer as built positions to rubber body after top layer of rubber body is fully opened.
Refer to Photo 3. Procedures to pull back upper layer is describe in Section 4.

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SECTION - 4

REMOVING THE SEPARATOR TAPE & PLASTIC FILM

This section describes a procedure for removing a strip of clear separator tape and plastic film from inside the rubber dam body. The tape and film, used in factory production of the rubber dam are located between top and bottom layers of rubber body.

Removal of the tape and the plastic film requires that the rubber body to be fully opened until the tape and all of the film is visible and removable, as described in the following steps.
This procedure requires mechanical equipment to pull back the top layer to remove every piece of plastic film and separator tape. The rubber body should be kept opened for work in Section 5.

The top and bottom layers of rubber body are sealed at the upstream end. It can be separated with a knife cutter (Photo 4).

Note : 1. The tape is not used during production of rubber dams with an inflated height (Hr) of under 1.60m (5-1/4').

Photo 4 : Separating Top And Bottom Layer Of Rubber Body

4 - 1. ATTACH LIFTING TOOLS 3 - 4 AT ANCHOR BOLT HOLE

Attach Lifting Tool – 3 at center and Lifting Tool – 4 at ends (or several Lifting Tool – 4) at anchor hole position to the upper layer of the rubber body. These are not supplied by Bridgestone. Open top layer of rubber body.

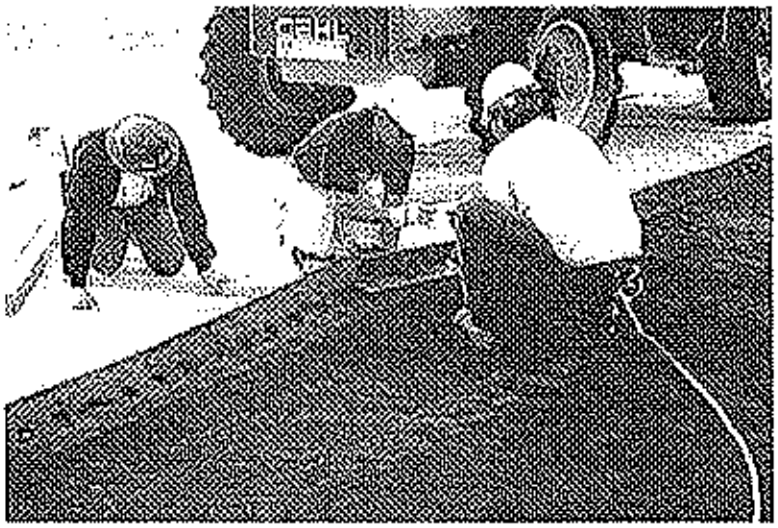


Photo 4-1-a : Attach Lifting Tool – 4

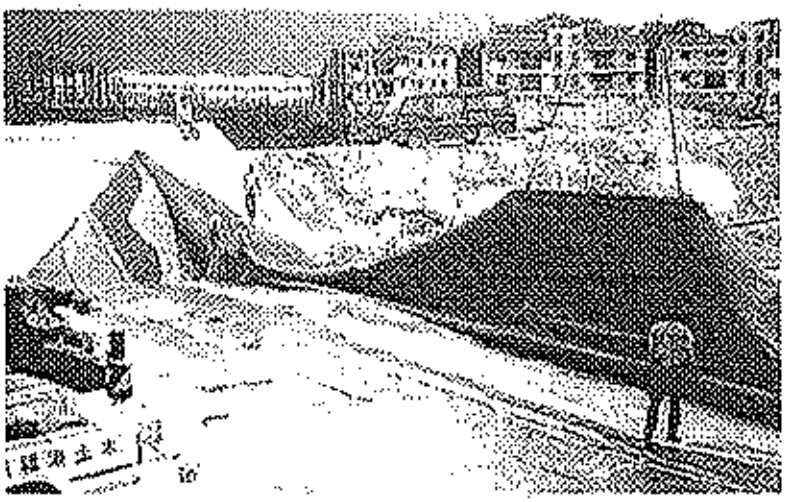
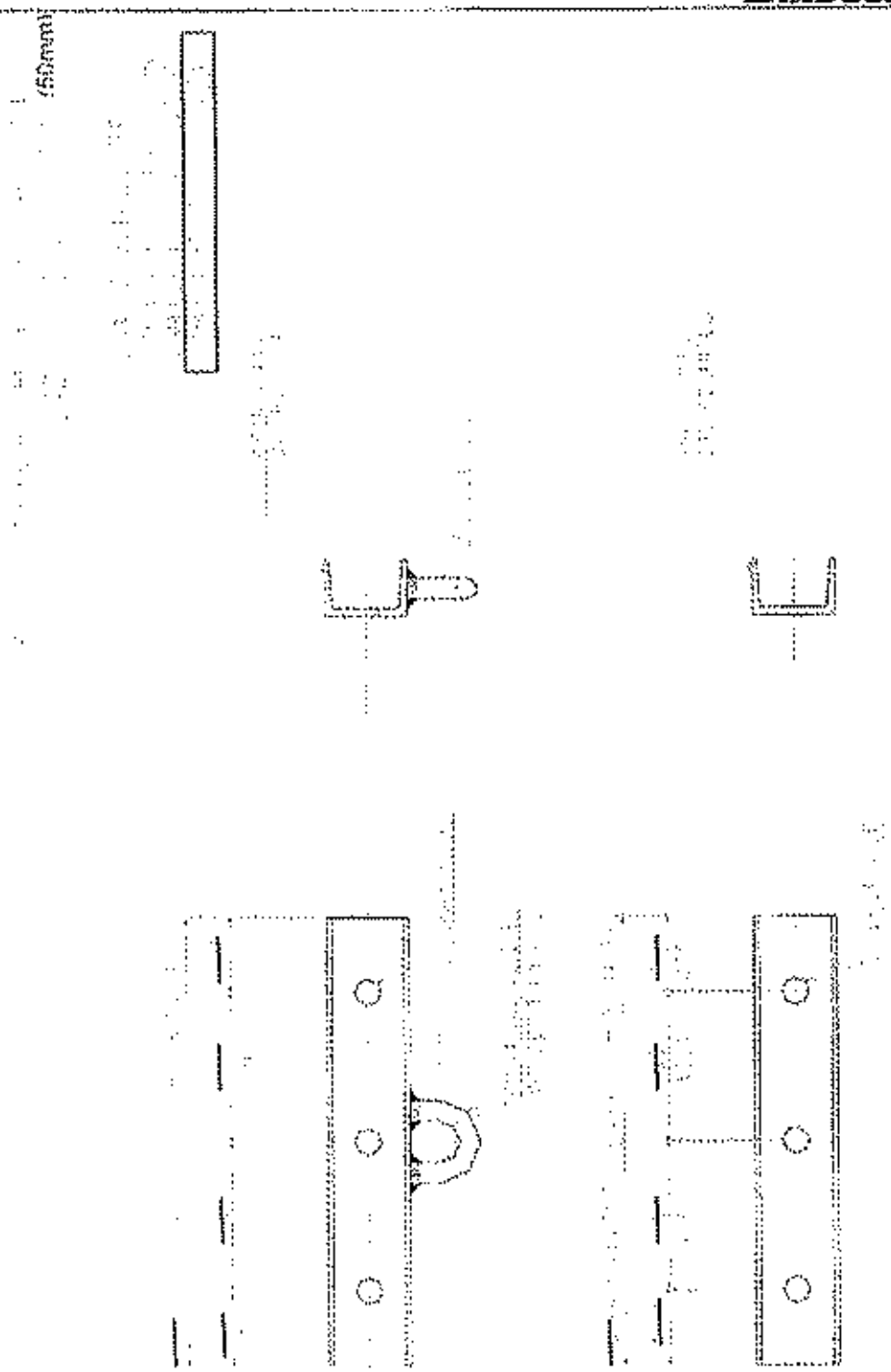


Photo 4-1-b : Opening Top Layer Of Rubber Body



Lifting Tool - 4 : Attached To The Rubber Body End

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4 - 2. REMOVE TAPE AND FILM

Attach crane cable (manpower may be sufficient for smaller dam) to Lifting Tool – 3 & 4, and pull back until access is gained to the tape and film, as shown in Photo 4-2 below.

Pull out all separator tape and plastic film from the rubber dam body. Repeat this and previous Step 4-1 until all tape and film, which run along the entire length of the rubber body, are removed. Keep rubber body open once finished for placement of spacer hoses in the following section.

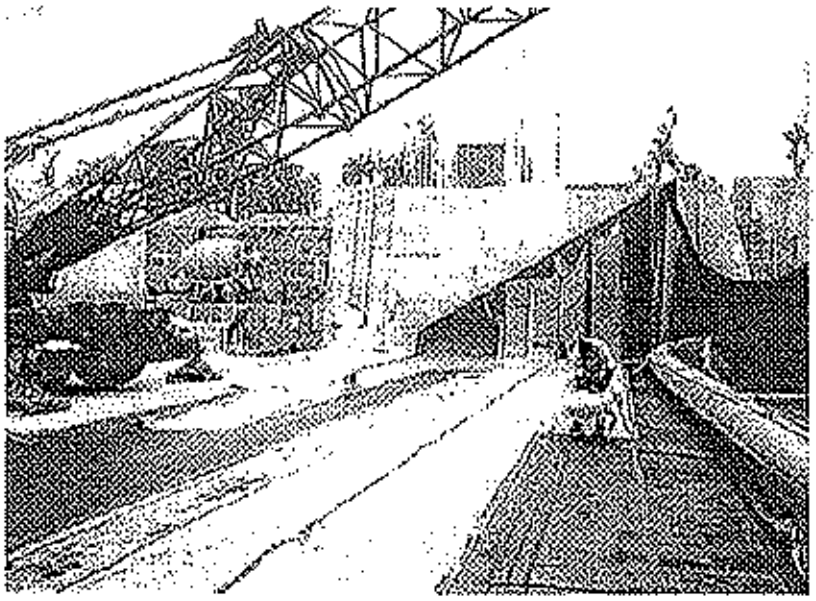


Photo 4-2 : R emove Film And Tape

SECTION - 5

INSTALLING PIPE FLANGES AND THE SPACERS SYSTEM

The spacers system rests within the rubber dam body to assure that all air is exhausted during deflation. As a deflating rubber dam body settles in either the middle or sides first, the exhaust of all air is not assured because all exhausting occurs from one side slope.

The Bridgestone spacer system is a simple way of achieving complete air exhaust from the rubber body. The term spacers refers to the fact that air escapes through its pipes and hoses as well as around the gaps created between the pipes. Installation of this system is simple and fast.

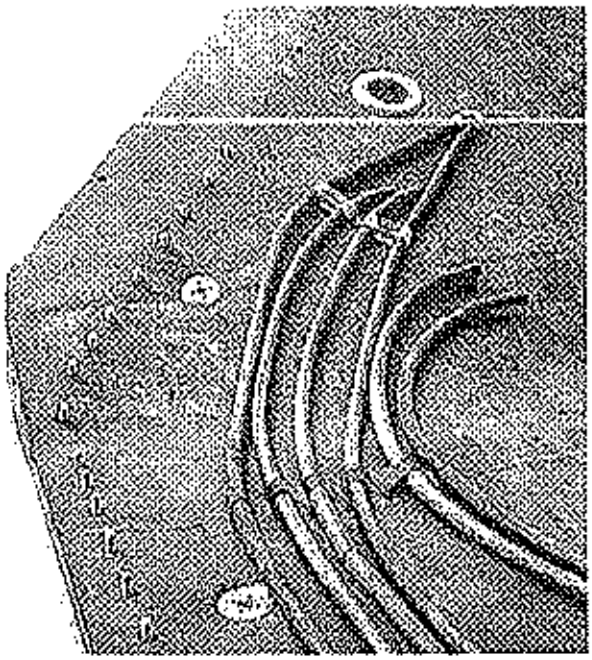


Photo. 5 : Install Spacer Hoses To Rubber Body

5 - 1. ATTACH SPACER HOSES

Attach spacer hoses to the clamp-1 with jubilie clips. The jubilie clips must not be in contact with the rubber body when the system is installed (Fig. 5-1-a).

Determine from the drawings the correct position on the lower layer (the layer in contact with the foundation) for the clamp-1. Attach the clamp-1 by drilling a 24mm +0, -2mm (15/16" +0, -1/16") hole on the lower layer of the rubber body.

Apply silicone caulk and insert the clamp-1 bolt from the bottom side of the rubber body, attaching as shown in Fig. 5-1-b (be sure there is a washer on this bolt between the rubber body and the back of the clamp-1).

Check that the jubilie clips attaching the spacer hoses to the clamp-1 do not touch the rubber. In the same manner as above, clamp the middle of the spacer hoses.

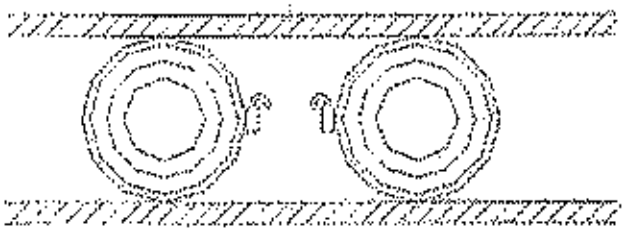


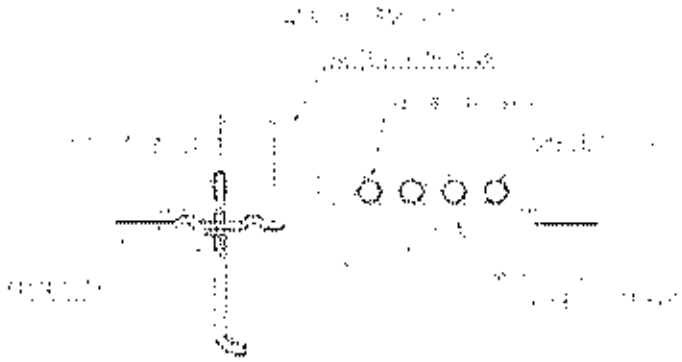
Fig. 5-1-a : Jubilie Clips Must Not Touch Rubber Body

Fig. 5-1-b : Secure Clamp-1, Clamp-2, and Spacer Hoses to Rubber Body

5 - 2. INSTALL SPACER HOSES IN RUBBER BODY

Set the spacer hoses inside the rubber body as shown in Fig.5-2-a below. The number of the spacer hoses and location of the fabric-1 are indicated in the drawing. After laying out the spacer hoses and lacing the fabric-1 on the spacer hoses, glue the fabric-1 to the rubber body as follows:

1. Roughen rubber body surface around the adhesive area and fabric-1 with wire scratch brush.
2. Mix cement SC 2000 with hardener UT-R20 in the ratio of 25:1. Apply one coat of cement to both rubber surfaces. After first coat has dried, apply second coat of cement to same area.
3. Place fabric-1 on rubber body just after second application of cement dried.
   Press down the fabric-1 with roller or hammer.



Width of Embedded Plate	L
165 mm (6-1/2")	65 mm (2-1/2")
198 mm (7-3/4")	80 mm (3-1/8")
257 mm (10-1/8")	110 mm (4-3/8")
250 mm (9-7/8")	110 mm (4-3/8")
300 mm (11-3/4")	135 mm (5-3/8")

Fig. 5-2-a : Install Spacer Hose

Size of Air Inlet-Outlet	Size (mm) x Min. Qty of Hose
50A	OD.50 x 2
80A	OD.50 x 4
100A	OD.50 x 4
150A - 200A	OD.50 x 4

Table. 5-2-b : Standard Size & Min. Qty of Spacer Hose

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5 - 3. INSTALL ADDITIONAL WAVE SPACER HOSES IN RUBBER BODY

If the design drawing indicated the wave spacer shown in Photo 5-3-a below is also to be installed, work should be performed as follows:

The replacement Rubber Dams for Tempe does not have wave spacers

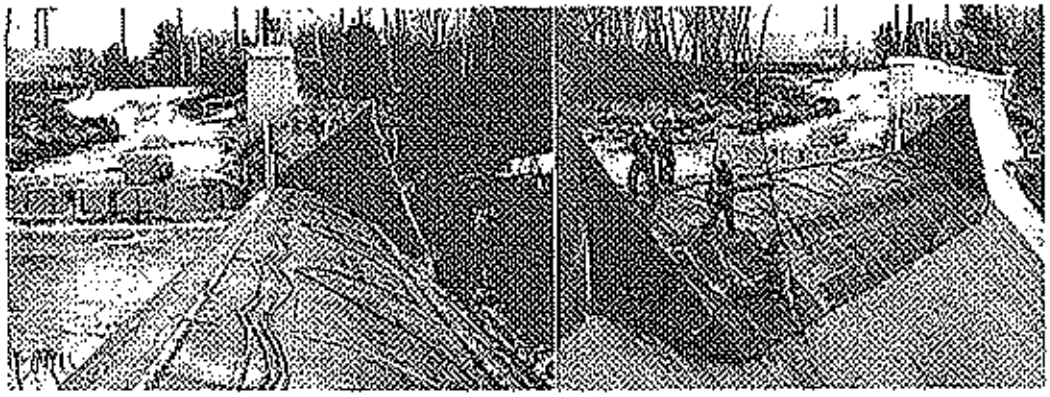

Photo. 5-3-a : Wave Spacer Hose

1. Lay down the spacer hose according to the position indicated in the drawing.
2. Mark position of peak and valley on the wave spacer hose.
3. Roughen rubber body surface around the adhesive area and fabric-2 with wire scratch brush.

4. Mix cement SC 4000 with hardener UT-R40 in the ratio of 25:1.
5. Apply one coat of cement to both rubber body surface and back surface of fabric-2 (TIP TOP EP-160). After first coat has dried, apply second coat of cement to same area.

6. Apply fabric-2 with folded spacer hose to area just after second application of cement dried.
7. Press down the fabric-2 with roller or hammer (refer to the Fig. 5-3-b next page).

Fig. 5-3-b : Fixed Wave Spacer To Rubber Body

Tight and fixed the end of wave spacer to normal spacer, as shown in photograph below.

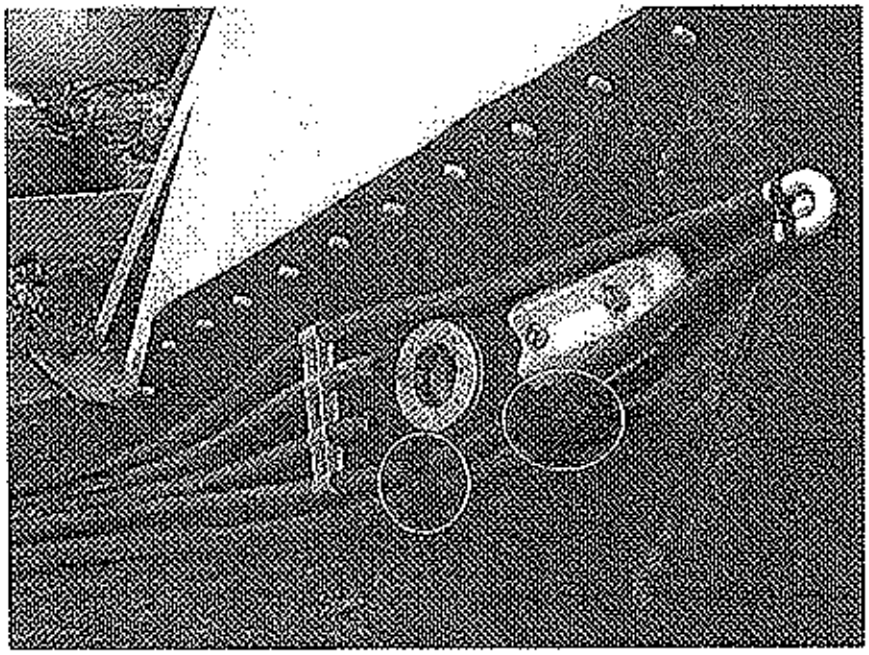

Photo. 5-3-c : Wave Spacer At Side Slope

5-4. ATTACH FLANGE COVERS

Screw in the threaded cover of the flanges for the air supply & exhaust, drain and pressure pipes. Torque all flanges to approximately 55 kg-m (400 lb.-ft) using the special tool supplied by Bridgestone which fits inside the flange.

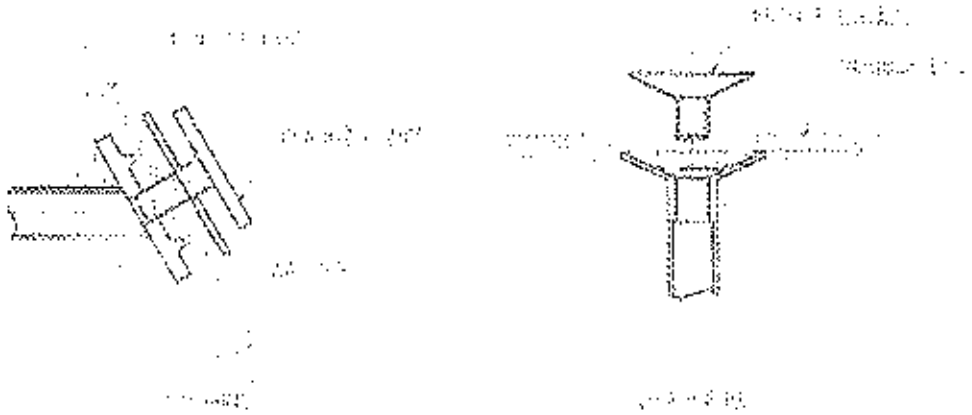

Fig. 5-4 : Attach Flange Cover

SECTION - 6

CLAMPING THE RUBBER DAM BODY

This section describes the bolting of the rubber dam body to its foundation.
Bolting the rubber body to the foundation perform two functions: anchoring it to the foundation and creating an air-tight seal between the lower and upper layers of rubber so that it will hold air once inflated.

6 - 1. LAY UPPER PART OF RUBBER BODY OVER ANCHOR BOLTS

Inspect for proper installation of all air flanges connected to the rubber body.
Remove protective material (vinyl hose) placed around anchor bolts.

Check that the inside of the rubber dam body is clear of all tools, paper, cloth, packing material, dirt, and debris.

Apply silicon sealant at both corners of riverbed foundation to prevent water leakage from the side slope corners: Refer to the Fig. 6-1.

Pull the upper part of the rubber body over the lower part. When completed, the anchor bolts should be penetrating both the lower and upper layers of the rubber body.

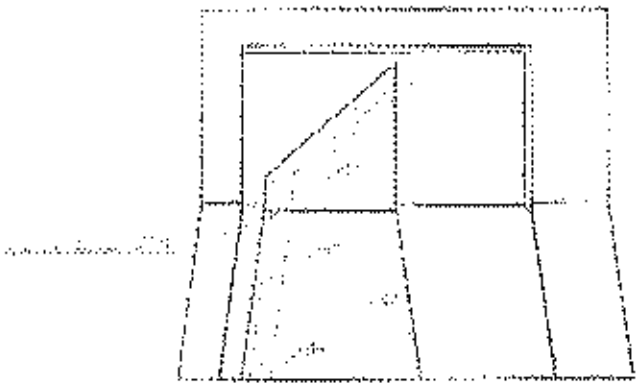

Fig. 6-1 : Apply Silicone Sealant

6 - 2. BOLT THE UPSTREAM ANCHOR LINE CLAMPING PLATES

Lay clamping plates over anchor bolts.
Place lock washers over anchor bolts.

Apply anti-seize grease (or MOLYCOAT) to the threads of all anchor bolts. As shown in photo 6-2-a, tighten with pneumatic wrench and use socket wrench to the torque determined by Bridgestone site advisor. Table 6-2-b shows the minimum required torque for the size of anchor bolts.

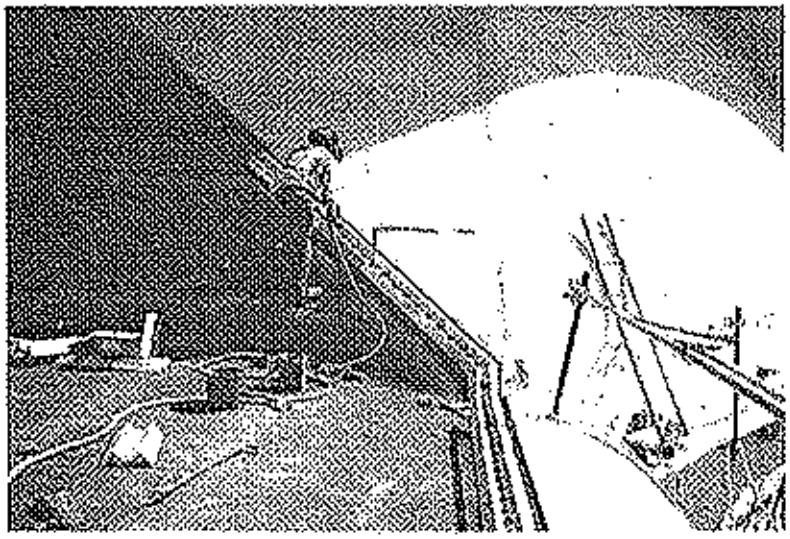

Photo 6-2-a : Tighten Anchor Bolt Nuts

Bolt Size*	Fastening Torque	
20mm (3/4")	10 kg-m (+3, -2 kgf-m)	72 (+22, -15) Lbs-f
24mm (7/8")	18 kg-m (+5, -3 kgf-m)	130 (+36, -22) Lbs-f
30mm (1-1/8")	35 kg-m (+10, -5 kgf-m)	252 (+72, -36) Lbs-f
36mm (1-1/2")	62 kg-m (+10, -5 kgf-m)	446 (+72, -36) Lbs-f

Table 6-2-b : Anchor Bolt Fastening Torque (*: Obtain from Drawing)

6 - 3. RE-TIGHTEN UPSTREAM ANCHOR BOLT NUTS

The stress relaxation of the rubber against the clamping plates requires that the upstream anchor bolts be re-torqued in no less than 12 hours from the initial tightening in Step 6-2. Frequency and period of interval of re-torque shall be determined by Bridgestone site advisor.

6 - 4. KEEP SPARE RUBBER

Save a piece of rubber from the rubber body as shown in below.
This spare rubber may be use for repairs.
Therefore, keep this spare rubber together with repair materials for future use.

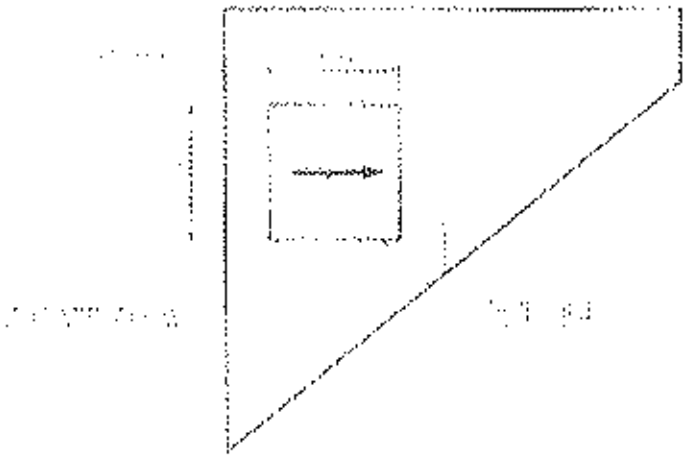

Fig. 6-4 : Spare Rubber

SECTION - 7

INFLATE RUBBER BODY AND TEST FOR AIR TIGHTNESS

The air tightness of the rubber body must be checked upon completion of its installation.
If the control system is not completed in time for the airtight test, a temporary air compressor and an accurate pressure gauge connected directly to the air supply and exhaust pipe can be used.

Inflate the rubber body to 70% of its design pressure. Apply soapy water to the entire clamping line along the riverbed and the side slopes. Check for air bubbles. Repair all air leaks.

If no leaks are observed, maintain the inflation for a minimum of 1 day, while monitoring the temperature and dam inner pressure, to confirm overall system air tightness.
Monitoring period shall be determined by Bridgestone site advisor.

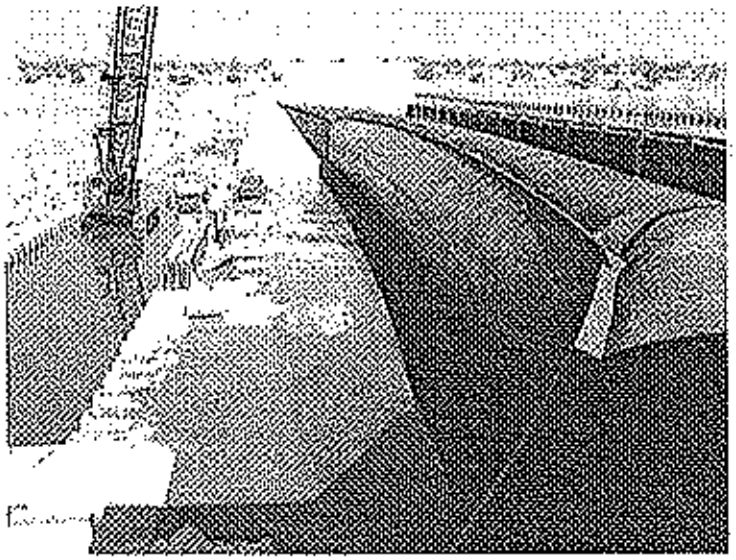

Photo 7 : Rubber Body Airtight Test