

First Aid for Fragile Artefacts

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How to First Aid for Fragile Artefacts

- How to temporarily increase the strength of artifacts
 - Temporary reinforcement of artifacts using *washi* (Japanese traditional paper) and gauze (lining)
 - Lifting artifacts using liquid nitrogen
- How to lift artifacts with surrounding soils
 - Lifting (banding) with a casting tape
 - Lifting using rigid polyurethane foam resin

Lifting using liquid nitrogen

- This method is used to temporarily reinforce the artifact by freezing the water contained within it with liquid nitrogen (boiling point: -195.82°C).



(Digging down around the artifact)
Freezing artifact using liquid nitrogen

Advantages of lifting using liquid nitrogen
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As no resins are used, field work proceeds quickly.

This method involves no problems such as removing resins used for temporary reinforcement after bringing artifacts into the laboratory, etc.

Lifting using casting tape

What is casting tape?



Casting tape is a glass fiber tape into which polyurethane resin has been impregnated. .

The tape is used after soaking it in water.

Setting time (ie., the time required until the tape hardens) is about four minutes.

Lifting using casting tape



1 Dig down around the artifact.

Lifting using casting tape



1 Dig down around the artifact.

2 Dip the tape into water.

Lifting using casting tape



- 1 Dig down around the artifact.
- 2 Dip the tape into water.
- 3 Wind up the tape around the dug artifact. (Setting time is approx. four minutes.)

Lifting using casting tape



1 Dig down around the artifact.

2 Dip the tape into water.

3 Wind up the tape around the artifact dug down. (Setting time is approx. four minutes.)

4 Cut out – Where necessary, cure the bottom of the artifact with a sand-contained container.



Lifting using rigid polyurethane foam resin

What is rigid polyurethane foam resin?

Ordinary rigid polyurethane foam resins are used by mixing and agitating two liquids, isocyanate and polyol (The mixing ratio of the resin used for this training program is 1:1).



Isocyanate

This resin hardens when it reacts with water.

Care should be taken not to allow moisture or raindrops to get into the resin when handling outdoors.



Polyol

Generally, polyol contains a catalyst and a foaming agent.



Mixing and Agitating



Foamed state

Although the resin theoretically expands approximately 30 times its original liquid volume; in practice, it is about 10 times due to the effects of humidity, etc.

Lifting using rigid polyurethane foam resin

Cylinder Type



Cylinder-contained spray type, capable of saving the labor required for weighing and agitation of the two liquids, and for uniformity of foaming



One Liquid Type



Spray type with one liquid, useful for spraying resin in narrow spaces

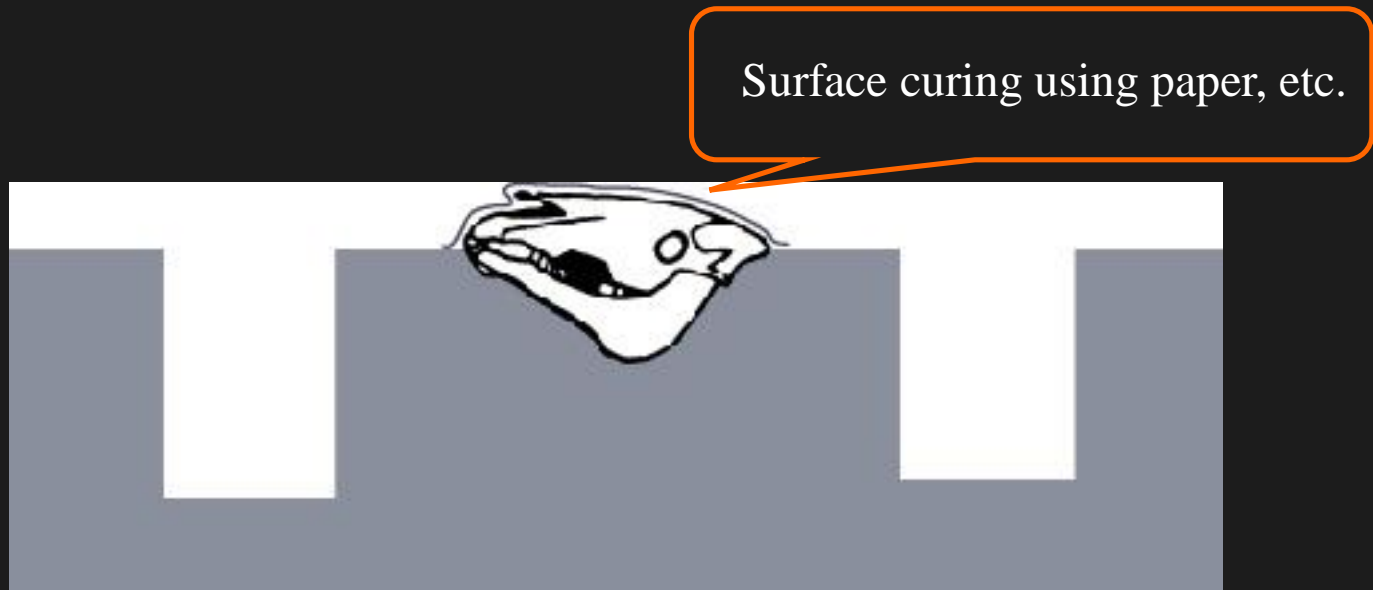


Lifting using rigid polyurethane foam resin



Digging down around an artifact

Lifting using rigid polyurethane foam resin



Curing of artifact surface

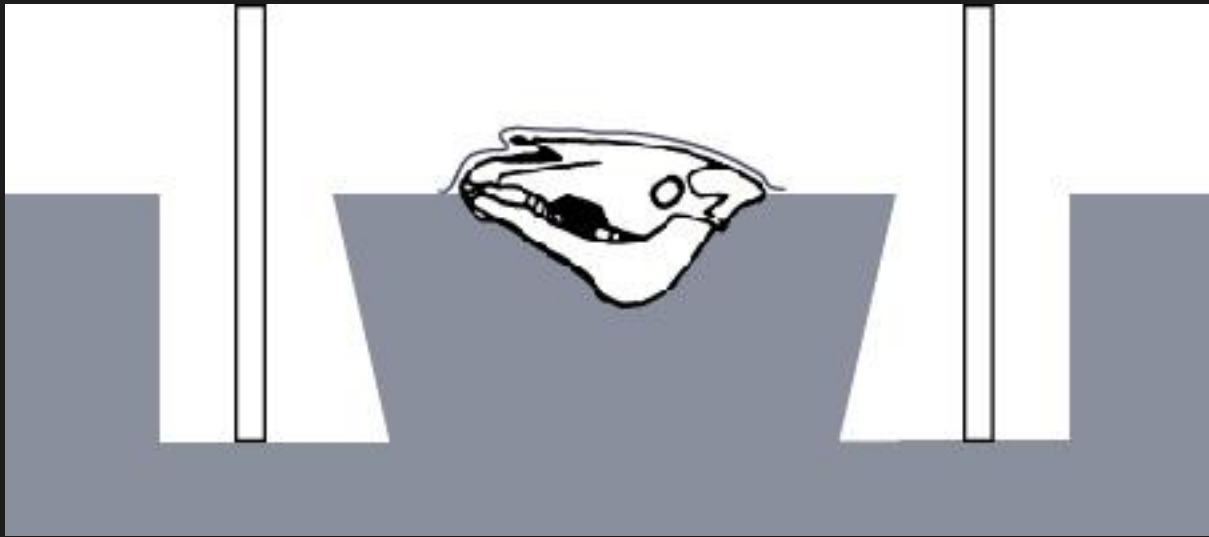
Aims to prevent direct contact between rigid polyurethane foam resin poured from above and an artifact

Lifting using rigid polyurethane foam resin



Digging down inward towards the base

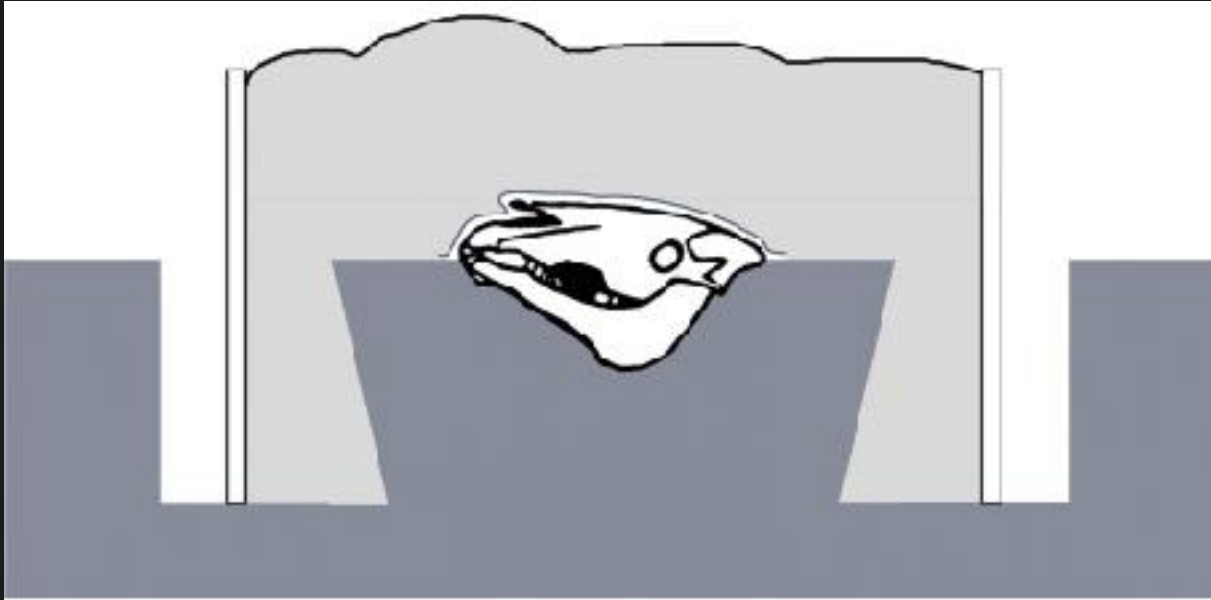
Lifting using rigid polyurethane foam resin



Installation of the outer frame into which urethane foam resin is poured.

An excessively solid frame should not be used, in order to protect the artifact from the pressure generated when the urethane foam resin expands, by releasing it outwards.

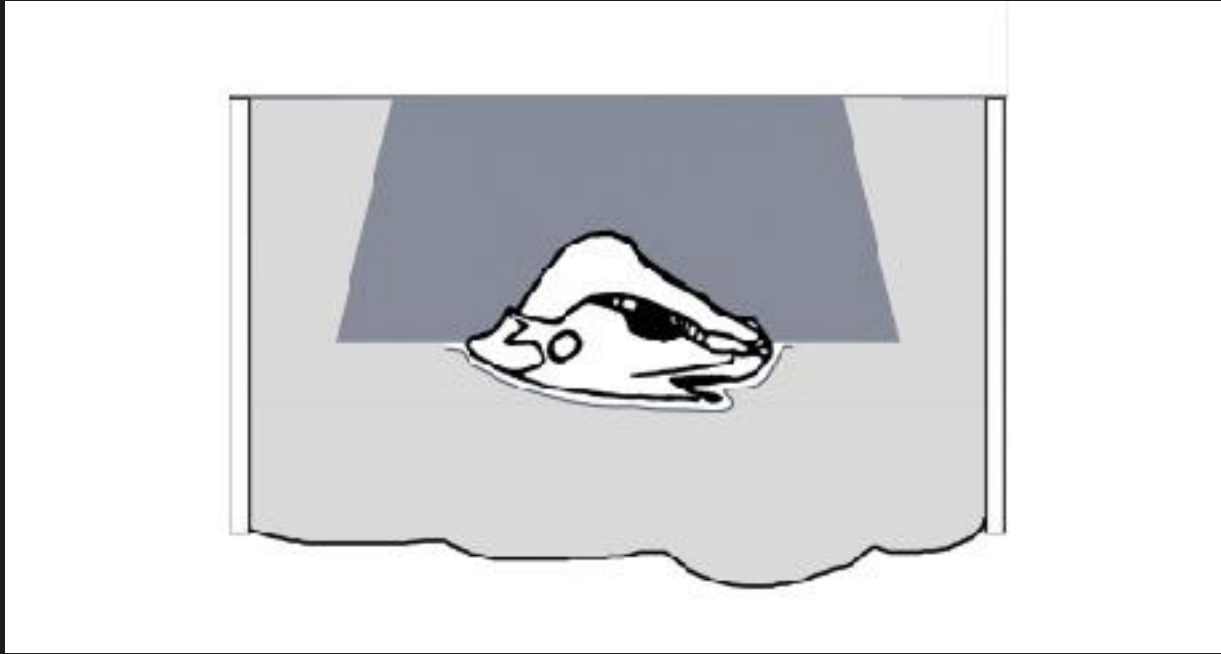
Lifting using rigid polyurethane foam resin



Pouring urethane foam resin

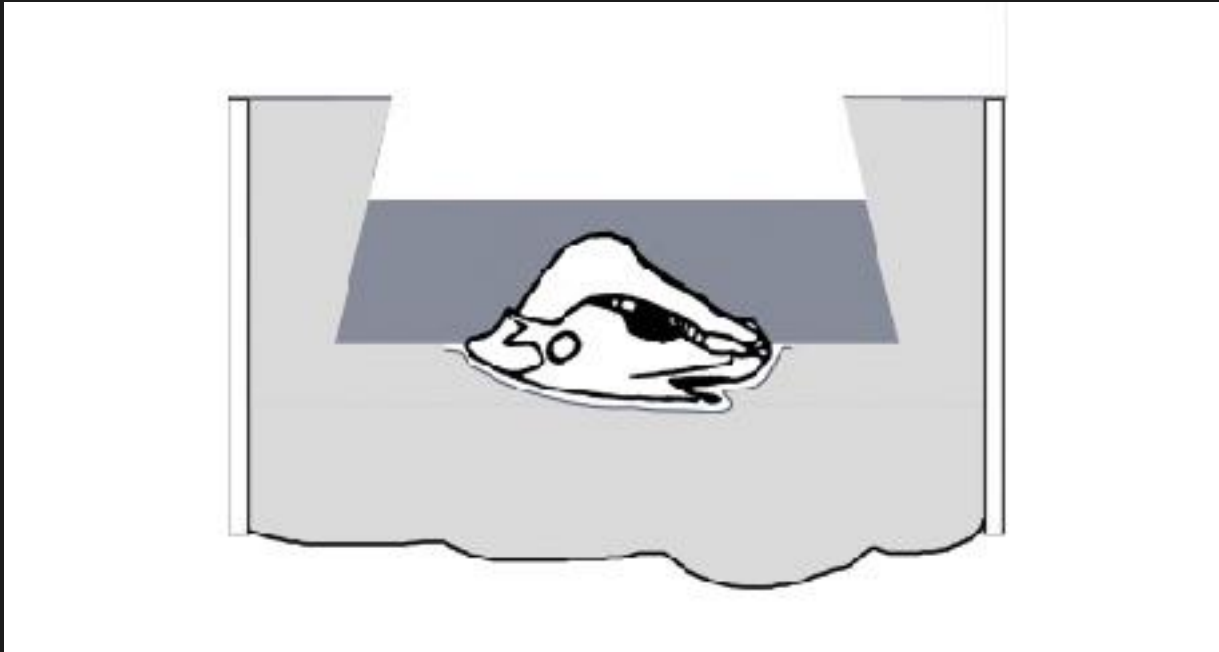
Resin should be poured separately in several times.
Care should be taken not to form pores inside.

Lifting using rigid polyurethane foam resin



Cutout/Upside down

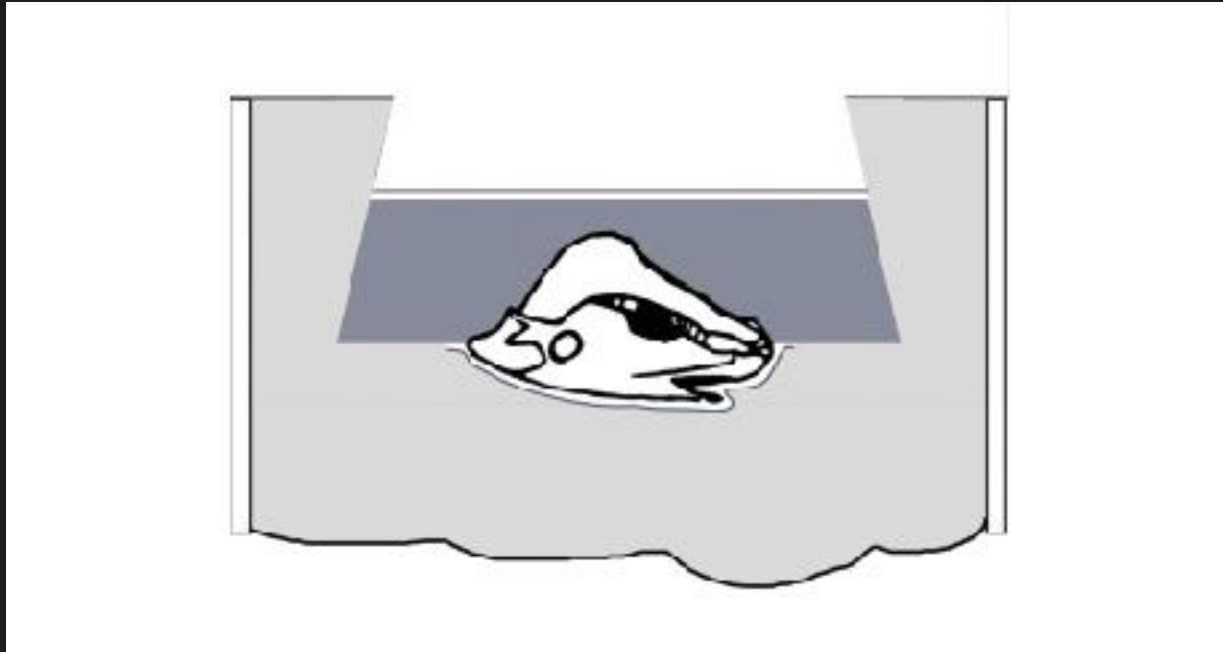
Lifting using rigid polyurethane foam resin



Removal of unnecessary soil

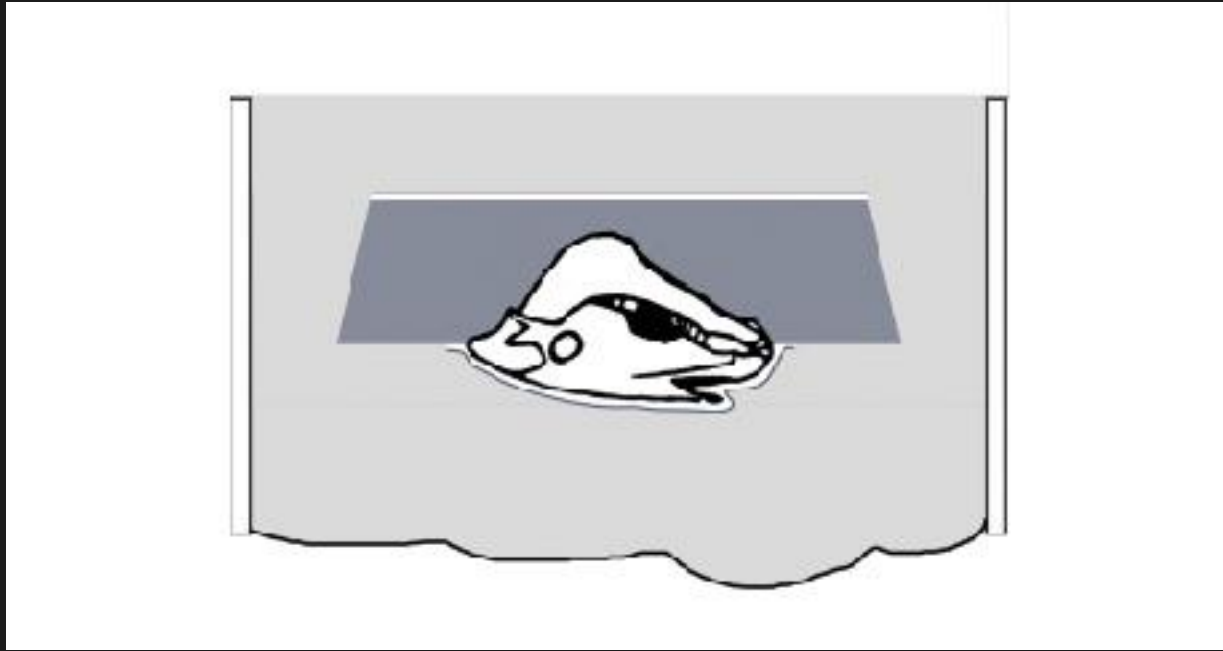
An artifact may be transported as it is, depending on its condition or the subsequent treatment plan.

Lifting using rigid polyurethane foam resin



Bottom reinforcement using FRP, etc.

Lifting using rigid polyurethane foam resin



Pouring urethane foam resin into the bottom

Actual lifting example



A barrel unearthed at the garden of the former Daijo-in temple

The barrel is wrapped with a bleached cotton cloth.



Actual lifting example



Curing the barrel inside

Paper is pasted with water. In addition, rigid polyurethane foam resin is sprayed over both the inside and outside of the barrel. (Two-liquid mixing cylinder type resin is used.)

Actual lifting example



The remaining half of the soil is removed.

Curing is conducted in the same way as above, and resin is sprayed.



Actual lifting example



Short pieces of lightweight styrene foam are enclosed inside.

The barrel is further sprayed, and fully covered with urethane foam resin.



Actual lifting example 2



The edge is cut, and, the side face is reinforced. The reinforcing frame is integrated by using urethane foam resin.



Actual lifting example



Lifting completed.

At present, the barrel has been completely treated by FD (freeze drying) and PEG (polyethylene glycol) impregnation application.

