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GUIDELINES FOR SAFE USE OF PRODUCTS CONTAINING ASBESTOS

PART 1 ASBESTOS CEMENT PRODUCTS

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Indian Standard

GUIDELINES FOR SAFE USE OF PRODUCTS CONTAINING ASBESTOS

PART 1 ASBESTOS CEMENT PRODUCTS

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(*Continued on page* 17)

Indian Standard

GUIDELINES FOR SAFE USE OF PRODUCTS CONTAINING ASBESTOS

PART 1 ASBESTOS CEMENT PRODUCTS

0. FOREWORD

0.1 This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards on 30 April 1987, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 In recent years there has been a growing awareness that exposure to asbestos dust can have harmful effects on the health of workers. In order to give guidance on how the risk of exposure to asbestos dust can be prevented, controlled or minimized, it was felt necessary to lay down some standards regarding safe use of different products containing asbestos, improving conditions in workplaces, preventive measures, protection and supervision of the health of workers, packaging and transport, disposal of asbestos waste, etc. This standard laying down guidelines for safe use of products containing asbestos has been prepared in three parts. This part of the standard lays down guidelines for safe use of asbestos cement products. Guidelines for safe use of friction materials containing asbestos and non-cement asbestos products other than friction materials are covered in Parts 2 and 3 respectively.

0.3 Asbestos cement products generally contain 10 to 15 percent asbestos fibres in a cement matrix that comprises the rest of the material and are termed as 'locked-in' asbestos products as these products have the asbestos fibres bound in cement. There is very little possibility of generation of airborne asbestos fibres during any reasonable handling, transport, storage and use of such products. However, during storing and installation, recommended work practices shall be followed to avoid harmful dust exposures.

0.4 In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from 'ILO Codes of practice: Safety in the use of asbestos', 1984 published by the International Labour Office, Geneva and ISO 7337 Asbestos reinforced cement products—Guidelines for on-site work practices, published by the International Organization for Standardization.

1. SCOPE

1.1 This standard lays down the guidelines for safe use of asbestos cement products.

2. OBJECT

2.1 The objects of this standard is to recommend procedures that shall be adopted to ensure that asbestos cement products are used safely and without harmful emission of asbestos dust.

3. APPLICATION

3.1 The provisions of this standard shall apply to any operation involving a risk of exposure to airborne asbestos dust arising during handling and installation of the following asbestos cement products:

a) Asbestos cement pressure pipes and joints,

b) Asbestos cement building and sanitary pipes and fittings,

c) Asbestos cement sheets and fittings for roofing and cladding, and

d) Asbestos cement flat sheets.

4. RECEIVING AND STORING OF ASBESTOS CEMENT PRODUCTS

4.1 During receiving and storing of products where asbestos is bound such as asbestos cement products, the recommendations given in **4.1.1** to **4.1.6** shall be followed to ensure minimum release of airborne dust, and thus minimum exposure of workers to such airborne asbestos dust.

4.1.1 When manual unloading is done, the pieces shall be lifted individually rather than sliding against abrasive surfaces that might release unnecessary fibres due to friction.

4.1.2 At the final stage of manufacturing or wherever asbestos cement products are being handled in large quantities, mechanical handling equipment shall be used, where practicable.

4.1.3 Individual boards, sheets or other products, when moved manually shall be placed with care on the stack or other resting site

4.1.4 Dropping and dragging of finished asbestos cement products shall be avoided.

4.1.5 All storage of asbestos cement products on site shall be made within a designated area which shall always be maintained clean.

4.1.6 Damaged and crushed pieces shall be suitably disposed of in accordance with the provisions laid down in IS : 11768-1986*.

*Recommendations for disposal of asbestos waste material.

5. WORK ON SITE

5.1 Asbestos cement products shall, where practicable, be delivered to the site ready for use and shall need no further processing which may generate dust.

5.2 Avoid creating dust and use hand tools or slow-running tools, which produce only coarse dust or chips, rather than high-speed machines or those which cut by abrading the material, thus generating inhalable dust.

5.3 When high speed tools are used, they shall be fitted with efficient dust extraction equipment designed for the purpose.

5.4 Abrasive or masonry discs shall not be used for cutting asbestos cement material.

5.5 For hand operations or short time and intermittent use of slow running tools in the open air, special precautions are not normally required.

5.6 When long continuous runs are carried out, dust extraction equipment shall be used with the machines, as in workshop conditions. Wet machining may be adopted, where practicable.

5.7 Sheets to be fixed in an overhead position shall be drilled, trimmed or rasped before they are in place. Where it is necessary to work on sheets in an overhead position and where dust is likely to reach the respiratory zone, a respirator shall be worn. However, such operations shall generally be avoided with proper planning.

5.8 Workplaces shall be kept clean as given in **8.1**.

6. WORKING PROCESSES AND RECOMMENDED TOOLS

6.1 Corrugated Sheets and Fittings — For sheets and fittings, the recommended tools for different working processes are given below:

Mitring	*Cross Cutting*	*Longitudinal Cutting*	*Cut Outs*	*Drilling*
Handsaw	Handsaw	Scriber	Handsaw	Hand-or-power operated drill
Scriber	Jig saw (*see* Note)	Jig saw (*see* Note)	Jig saw (*see* Note)	
Nibbler	Nibbler	Handsaw	Low speed circular saw	
Jig saw (*see* Note)	Low speed circular saw	Nibbler		
Hand-guided band saw		Low speed circular saw		
Low speed circular saw				

NOTE — Other machanically operated saws may be used with special precautions. Circular high speed saws are not recommended.

6.2 Flat Sheets — For flat sheets, the recommended tools for different working processes are given below:

a) General:

Cutting	*Drilling*	*Sanding*	*Cut Outs*
Handsaw	Hand-or-power operated drills	Power-driven sanders	Handsaw
Nibbler up to 10 mm (depending on design)		(This shall not be used unless provided with dust extraction equipment)	Jig saw
Low speed circular saw			Hand-or-power operated drills
			Low speed circular saw

b) For thickness up to 6 mm:

Scriber	Hand-or-power-operated drills	Power-driven sanders	Handsaw
Nibbler		(This shall not be used unless provided with dust extraction equipment)	Nibbler
Hammer shears			Jig saw
Low speed circular saw			Hand-or-power operated drills
			Low speed circular saw

6.3 Pipes — The recommended tools for different working processes of the pipes are given below:

a) For diameter up to 600 mm:

Cutting	*Turning*	*Drilling and Cut Outs*
Handsaw (small diameters)	Hand-operated lathe	Handsaw
Hand-operated lathe cutter	Power-operated lathe	Jig saw with carbide tipped blade

Cutting	*Turning*	*Drilling and Cut Outs*
Power-driven lathe cutter		Hand drill
Jig saw (plus guiding device for diameter 350 to 600 mm)		Power drill
Chain cutter		Hand operated hole cutter
Hand-guided band-saw		Power-driven hole cutter with milling head
Low speed circular saw		Power drill with hardmetal bit

b) For diameter above 600 mm:

Cutting	*Turning*	*Drilltng and Cut Outs*
Hand-operated lathe cutter	Hand-operated lathe	Jig saw with carbide tipped blade
Power-driven lathe cutter	Power-operated lathe	Power drill
Chain cutter up to diameter 800		Hand-operated hole cutter
Hand guided bandsaw		Power-driven hole cutter with milling head
Low speed circular saw		Power drill with hardmetal bit

7. TOOLS SPECIFICATION

7.1 Power-Driven Saws Such as Jig Saws, Circular Saws, Band Saws, etc (*see* Fig. 1, 2 and 3)

7.1.1 When working asbestos reinforced cement products with power-driven equipment, such as saws, jig saws and band saws, the fineness of the dust produced depends primarily on the geometry of the saw blade as well as on the blade speed (number of strokes, number of revolutions, etc) of the machine.

7.1.2 With a machine operating at a high frequency together with a fine saw blade, an excessive amount of respirable fine dust is produced due to the grinding action and hence, such type of saw is not recommended.

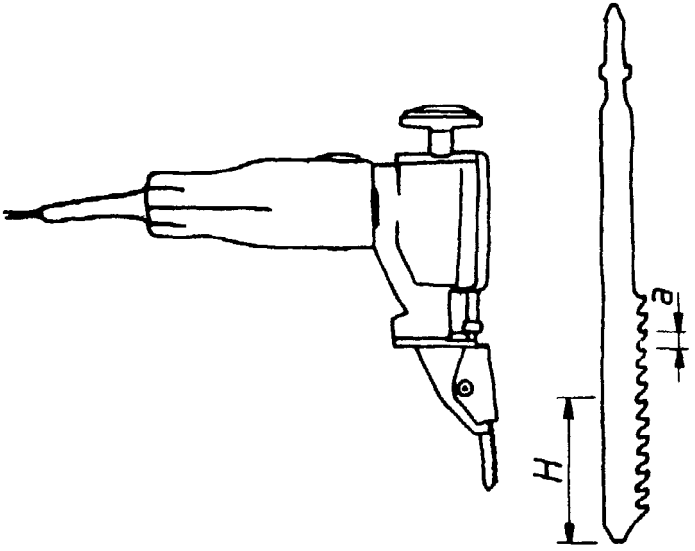

FIG. 1 JIG SAW

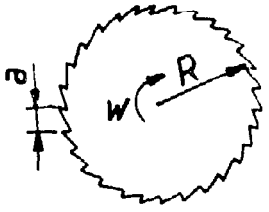

FIG. 2 SAW BLADE OF A CIRCULAR SAW

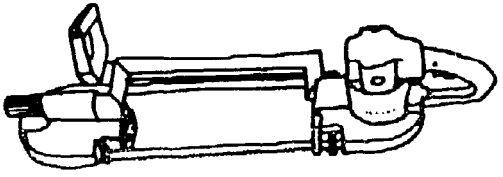

FIG. 3 HAND-GUIDED BAND SAW

7.1.3 With a coarse-toothed saw and a low frequency, a chip-cutting action takes place which produces mainly coarse dust. Under certain conditions such saw does not require any dust extraction equipment.

7.1.4 Low speed circular saws with milling action produce coarse chips and do not require dust extraction.

7.1.5 The type of machinery is assessed by the following formula:

$$d = \frac{va}{k}$$

where

d = calculated chip thickness im μm;

v = rate of feed in mm per minute;

a = tooth spacing in mm;

k = speed of the cutting teeth in mm per minute and is given by the following formula:

$k = Hf$, for reciprocating movement; and

$k = wR = 2\pi Rf$, for radial movement

H = length of stroke in mm;

f = frequency (number of strokes or revolutions) in revolutions per minute;

w = angular velocity in radians per minute; and

R = radius of circular saw blade in mm.

7.1.6 When working without dust extraction, the feed rate shall be so chosen that the required chip thickness is reached under normal operating conditions. For a given frequency of the machine and a given saw blade, the feed rate depends principally on the shearing force as well as the thickness and the properties of the material being cut.

7.1.7 A certain proportion of fine dust will be produced even when operating with a thick chip. For this reason, the required thickness of chip lies considerably above the dimensions of respirable dust particles.

7.1.8 The working process with a rotating saw blade is exactly the same as that of the working stroke of a machine with a reciprocating motion. However, on the return stroke, a grinding effect occurs which produces fine dust. The proportion of fine dust produced during the working stroke is, therefore, to be reduced to compensate for the fine dust produced during the return stroke in order to maintain a similar average dust concentration. Less fine dust is produced on the return stroke when using thick saw blades because of the reduced surface pressure.

7.1.9 The cooling air for a jig saw is often so directed that the fine dust falling from the saw blade is blown away. This sort of air flow is not permissible for working of asbestos reinforced cement products.

7.1.10 Fine dust produced, when a jig saw works with a grinding action, shall be removed by means of concentrated suction apparatus.

7.1.11 Some empirical criteria for working with or without dust extraction device when using saws with rotating and reciprocating blades are given below:

Chip Thickness	*Recommendations*
a) Saws with rotating blades:	
1) $d > 100$ μm	Extraction usually not required
2) $d < 50$ μm	Not recommended for field
3) $50 < d < 100$ μm	Extraction not required for occasional use but required for continuous use
b) Saws with reciprocating blades:	
1) $d > 200$ μm	Extraction usually not required
2) $d < 100$ μm	Not recommended for field
3) $100 < d < 200$ μm	Extraction not required for occasional use but required for continuous use

7.1.12 Circular saws, which work with a grinding action, shall be equipped with dust extraction comprising upper and lower suction. The lower extracter shall be adjustable and shall be so arranged that, in every case, the extractor touches the underside of the sheet. This is again not recommended for use in the field.

7.2 Power-Driven Nibblers — For power-driven nibblers, calculated chip thickness is assessed by the following formula:

$$d = \frac{v}{f}$$

7.2.1 *Tools with a Punching Action* (*see Fig.* 4)

7.2.1.1 These tools work in such a way that the piston of the aggregate moves up and through the sheet to be adjusted. One cut of approximately 10 mm width is effected per stroke.

7.2.1.2 The cut edge of the sheet becomes chamfered, the trace being wider on the underside of the sheet. This effect increases with the thickness of the sheet.

7.2.1.3 Extraction is not required if the calculated chip thickness satisfies the following conditions:

$$d > 500\ \mu m$$

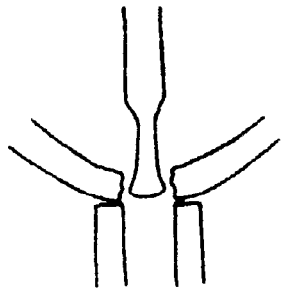

FIG. 4 TOOL WITH PUNCHING ACTION

7.2.2 *Tools with a Shearing Action* (*see Fig.* 5)

7.2.2.1 These tools work in such a way that the knife of the cutting aggregate moves up and down between two stationery jaws. The cutting edge of the sheet is perpendicular to the surfaces of the sheet.

7.2.2.2 Cutting from the back of the sheet effects absolutely sharp edges on the top side of the sheet (particularly autoclaved sheets).

7.2.2.3 The sheering action does not actually produce chips. The asbestos-cement material between the two stationary jaws becomes highly compressed and is peeled off continuously. This compression effects adequate stress of the blade. Working of asbestos-cement products with shearing tools is, therefore, limited to flat sheets up to approximately 8 mm.

7.2.2.4 In spite of the fact that chips are not really produced, a theoretical chip thickness may be calculated. Extraction is not required if the calculated chip thickness satisfies the following condition:

$$d > 200\ \mu m$$

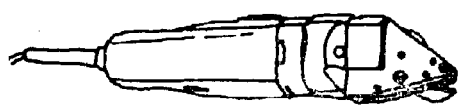

FIG. 5 TOOL WITH SHEARING ACTION

7.3 Tools for Working Pipes

7.3.1 *Lathe Cutter, Lathe and Hole Cutter* — These tools work by means of a rotating hardmetal chisel (or even two for a hole cutter) fixed on a turning frame.

7.3.1.1 *Lathe cutter* (*see Fig.* 6) — The lathe cutter, when completely assembled, may be pushed over the pipe or may be assembled around the pipe in the trench. The pipe is cut by a hardmetal chisel which rotates around the pipe. Closer adjustments of the chisel may be made by hand or with a screw nut. Lathe cutters are available with manual turning handles or optional power drive.

This operation produces coarse dust because of the low frequency. Dust extraction is unnecessary.

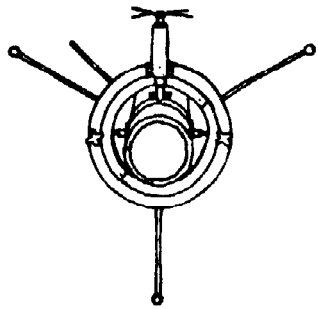

FIG. 6 LATHE CUTTER

7.3.1.2 *Lathe* (*see Fig.* 7) — The lathe used to end-trim and re-machine rough pipe-barrels to the necessary end profiles consists of an adjustable self-aligning arbor inserted into the pipe bore, a screw-fed turning frame, blades and manual turning handles or an optional power drive.

This operation produces coarse dust because of the low frequency. Dust extraction is not recommended.

7.3.1.3 *Hole cutter* (*see Fig.* 8) — The hole cutter consists of a turning frame, two chisels and manual turning handles or optional power drive. The turning frame is affixed in the pipe barrel.

This operation at a low frequency produces little dust. Dust extraction is unnecessary.

7.3.2 *Jig Saw* (*see Fig.* 9) — Large jig saws for cutting pipes up to 600 mm diameter consist of a driving engine of approximately 700 W or more and hardmetal toothed saw blade of a length up to 1 000 mm.

For stability reasons, this cutting unit needs a guiding and holding device to cut pipes with diameters exceeding 350 mm.

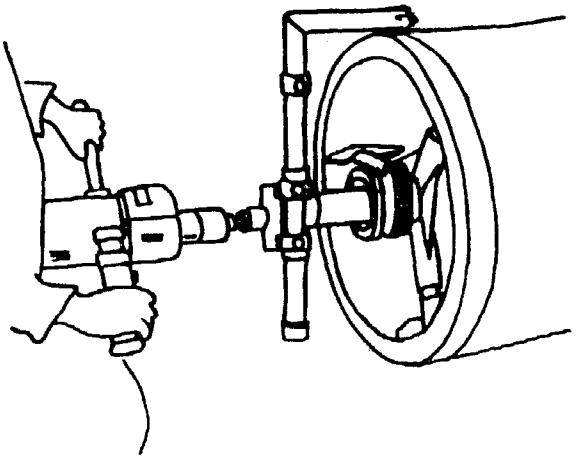

FIG. 7 LATHE

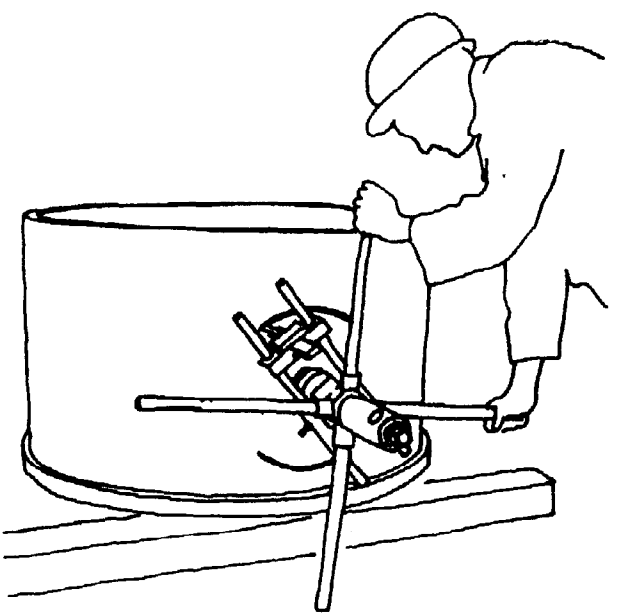

FIG. 8 HOLE CUTTER

Low frequency and wide tooth spacing produce coarse dust. Dust extraction is not necessary if the calculated chip thickness satisfies the following condition:

$$d > 200\ \mu m$$

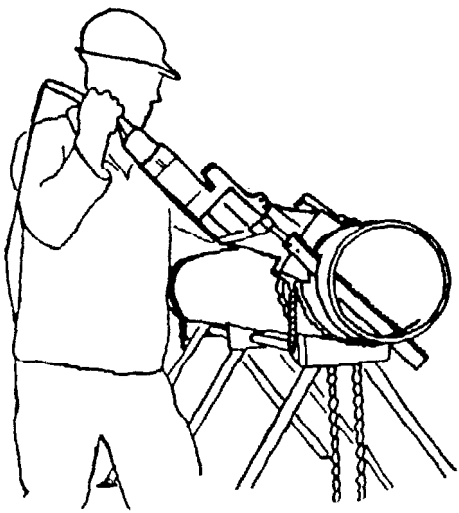

FIG. 9 LARGE JIG SAW

7.3.3 *Low Speed Circular Saw* (*see Fig.* 10) — The low speed circular saw is powered by a motor of approximately 330 W and has a speed of 250 revolutions per minute. The blade of typically 115 mm is tipped with hardmetal teeth. The low speed circular saw does not require dust extraction.

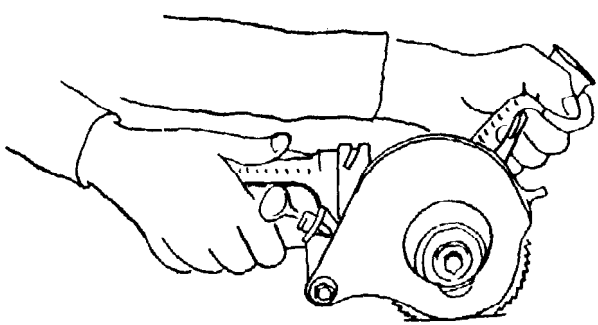

FIG. 10 LOW SPEED CIRCULAR SAW

7.3.4 *Chain Cutter* (*see Fig.* 11) — Chain cutters operate by means of cutting wheels, mounted in a chain wrapped around the pipe barrel. Hydraulic pressure, applied by means of a remote electric or manually operated pump, simultaneously squeezes the cutting wheels into the pipe-wall until the material shears along the squeezing line. Because of the shearing process, cutting with the chain is practically dust-free and no chip thickness is to be calculated.

The chain cutter is particularly recommended for autoclaved pipes. Its use for non-autoclaved pipes is not recommended due to the poor quality of the cut.

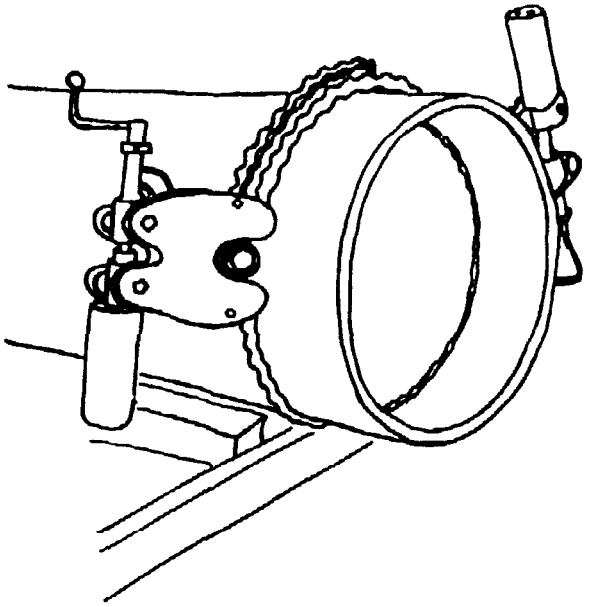

FIG. 11 CHAIN CUTTER

8. WASTE DISPOSAL

8.1 Waste material shall not be allowed to accumulate on the floor. All working areas should be kept clean by regular use of vacuum cleaner. Where vacuum cleaning is not practicable, the waste material shall be thoroughly wetted before removal. Cleaning shall be done in accordance with the provision laid down in IS : 11767-1986*.

8.2 Broken pieces and off-cuts of asbestos cement material shall be collected and disposed of in a manner which does not generate dust.

*Recommendations for cleaning of premises and plants using asbestos fibres.

8.3 Loose swarf and dust collected from fabrication processes shall be wetted, where practicable, and placed in sealed impermeable bags and disposed of in accordance with the procedure given in IS : 11768-1986*.

9. WARNING

9.1 Asbestos cement products shall bear a pictorial warning sign as given in 'Indian Standard Recommendations for pictorial warning signs and precautionary notices for asbestos and products containing asbestos: Part 2 Asbestos and its products' (*under preparation*) to caution the users that these products contain asbestos fibres and improper use of these materials may result in generation of asbestos dust, inhalation of which may cause serious damage to health.

10. SAFETY RULES SHEET

10.1 Safety rules sheat covering the following information are required to be published by the manufacturers and shall be referred to for safety in the use of asbestos cement products:

a) Product designation;

b) Name and address of the manufacturer of the product;

c) Health hazards that might arise from inhalation of asbestos dust;

d) Procedures for cleaning and safe disposal of asbestos, collected for waste and dust extraction system; and

e) Precautionary information regarding handling of the product.

*Recommendations for disposal of asbestos waste material.

(*Continued from page* 2)

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(*Continued on page* 18)

(*Continued from page* 17)

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