

# LIME MARMALADE

## Introduction

As the name suggests, lime marmalade is a preserve made from limes and sugar. Marmalades can also be made from other citrus fruits - notably oranges, lemons, grapefruit or a mixture of any of these. This recipe is based on practical experiences of making lime marmalade in the West Indies. When using other citrus fruits or limes that are grown in a different region, it is likely that minor modifications to the formulation will be needed to account for the different levels of acidity.

## Production

The production of traditional lime marmalade by the small-scale processor is perfectly feasible provided the equipment is available and the general principles for jam making are understood and followed.

Lime marmalade is made according to the basic principles of jam and marmalade production. However, there are two potential problem areas which the processor should be aware of:

1. Lime is unusual in that it has a very high acidity (and low pH). Jams and jellies need to have a pH between 3.0 and 3.3 to enable the pectin to set the gel. Most fruits lie in this pH range but if they have a pH higher than 3.3, citric acid can be added to the fruit to bring the pH down to the required range. Lime juice however has a pH of 2.7 to 2.9 and therefore the pH has to be increased. It is possible to do this quite easily by adding sodium bicarbonate (baking powder) to the fruit pulp.

In the experience in the West Indies, it was found that the addition of 20g of sodium bicarbonate per litre of lime juice was sufficient to give the required pH adjustment. In each situation, it is important to get the correct pH, which should be done by adding sodium bicarbonate to the lime juice and measuring the acidity with a pH meter.

If a pH meter is not available, it may be necessary to seek outside advice. Alternatively, the amount to add can be determined by trial and error. Carry out a series of small trial batches using different levels of bicarbonate and find out the best level by checking the set of the marmalade.

2. The second problem in marmalade production is getting an even distribution of shredded peel throughout the product. If the correct technique is not used the peel tends to float to the surface of the jar during setting. It is important to soak the peel slices in a sugar solution before they are added to the marmalade to increase their density. This means that the marmalade making process is somewhat longer than for jam making and planning for production should take this into account.

At first glance the production of jams and marmalade may seem like the best option for utilising a glut of fruit. In fact, this is not the case. To make a consistently good quality product requires a certain level of skill and technical input and some specialist equipment – stainless steel boiling pans, refractometer, glass jars and lids for packaging. Preserve making also requires large quantities of sugar and in some cases the addition of pectin, both of which can be expensive ingredients. Therefore, as with all food products, it is essential that the processor carries out a full technical, economic and marketing feasibility study prior to starting the enterprise. Not only will this exercise determine the potential market for the products, it will be a useful tool for planning production and day-to-day running of the business and can be used to approach a bank for a loan if one is required. See the Practical action technical brief on how to carry out a market and technical feasibility study for further information.

## Recipe

1 litre lime juice  
 20g sodium bicarbonate  
 3kg sugar  
 1200g 5 SAG pectin (made up from 40g pectin, 200g sugar, 960ml water)  
 Few drops of green food colour (optional)  
 200g prepared sugared lime peel

### Lime juice

The extraction of lime juice is the most time consuming step for the small-scale manufacturer. It is strongly recommended that if a local commercial lime processor exists, racked juice should be purchased in bulk.

If no such supplier exists then there is no alternative but to extract the juice oneself using small manual or electric squeezers (see Figure 1). It must be remembered at all times that lime juice is very acidic and therefore attacks metals. It is essential to use only good quality food-grade plastic, stainless steel and wooden utensils to collect the juice. The extracted juice must be strained to remove pulp prior to use. If required, lime juice can be extracted and stored in bulk preserved with 1000ppm sulphur dioxide (using 3g of sodium metabisulphite per litre of juice).

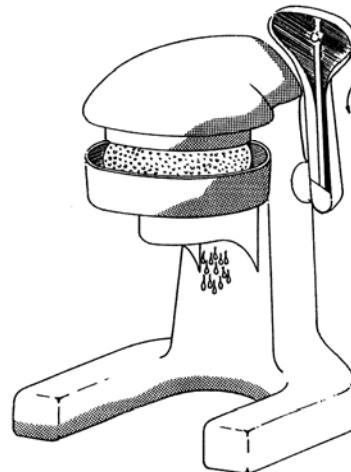


Figure 1: Small manual squeezer

### Lime peel

The lime peel needs to be cut into very thin strips about 12 to 25mm long and as thin as possible. This is another slow and tedious job which can also be a potential hazard point for contamination by flies and other insects. The cut slices should be kept covered until they are used. A very sharp stainless steel knife should be used to cut the peel into slices. The process can be speeded up by using a small peeler to remove the peel from the limes (see Figure 2) before they are squeezed.

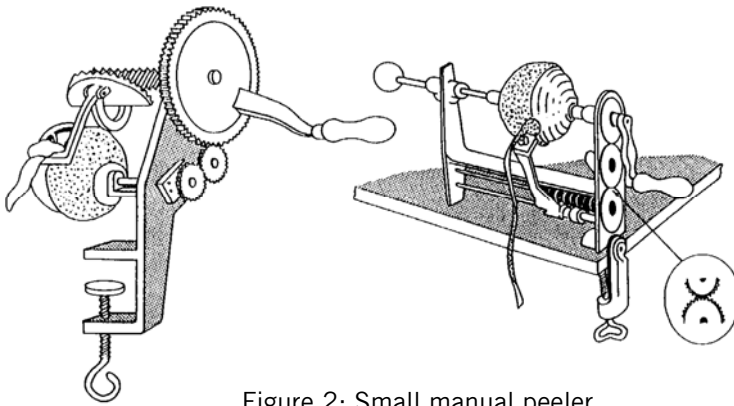


Figure 2: Small manual peeler

## Treatment of the peel

If fresh peel is incorporated directly into the marmalade it will float to the surface during setting and produce a very unsatisfactory product. The shredded peel needs to be saturated with sugar before use so that it has the same density as the marmalade and stays suspended in the gel and evenly distributed through the jar.

The shredded peel should be well mixed with dry sugar (1kg peel + 1kg sugar) and left in a sealed container for at least a week, mixing occasionally. During this time a sugar solution will form as the moisture from the peel mixes with the dry sugar. The pieces of peel will float in the heavy sugar syrup. Sodium metabisulphate can be added to the sugar (1g per 1kg of peel) to prevent the growth of moulds and yeasts.

This sweet mixture of peel and sugar will be highly attractive to ants and insects. Make sure that the container is covered with a lid or netting and stand it in a trough of water to prevent ants.

## Pectin

The ideal situation is to use commercially available pectin as it has a standard setting power and produces the same product time after time. If it is impossible (or too costly) to buy pectin, it can be extracted from citrus peels or passion fruit rinds, but you will have to experiment on how much to add to the juice to get a good set (see the technical brief on fruit waste utilisation for more information on pectin production).

The best pectin for marmalade is a fast-set pectin. Fast set pectin is preferable because it forms a gel quickly and so holds the pieces of peel in place throughout the marmalade. The usual strength of commercial pectin is 150 SAG. To make marmalade you need a pectin with a setting power of about 5SAG. Therefore the commercial pectin needs to be diluted (30 times in this case) prior to use.

## Preparation of 5 SAG pectin working solution

30g of 150 SAG pectin  
150g sugar  
720ml water

- Dry mix the pectin and sugar thoroughly.
- Heat the water to 70-75°C and slowly add the sugar/pectin, mix with constant stirring. If a small electric stirrer is available there will be less chance of lumps forming.
- Heat to boiling and boil for 1 minute, again with constant stirring.
- Hold at 50-60°C (a double saucepan is useful here).

## Batch preparation

The technical brief on jams and marmalade production outlines the principles of jam boiling. Ideally a heavy based stainless steel pan or double bottomed jam pan will be available for boiling the mixture. The other desirable pieces of equipment are a wooden stirrer, jam thermometer and possibly a refractometer (figure 3) for testing the total soluble solids and determining the end point of the boiling process.

## Method

1. Place the lime juice, bicarbonate and half the sugar in the pan, heat slowly to dissolve the sugar and then bring to the boil. Boil for 3 - 5 minutes with steady stirring (it is impossible to state boiling times exactly, as this depends on the heat source etc).
2. Add the remaining half of the sugar, peel, pectin and green colour and continue boiling until the required sugar level (68%) is reached (as measured either by refractometer, jam boiling thermometer or skill of the producer).

### 3. Filling and capping

Hot fill the finished preserve into clean, dry jars and cap immediately. Care is needed not to fill too hot or too cold, the ideal range being 82-85°C. Filling whilst too hot can result in drops of steam condensing on the inside of the lid, falling back onto the surface of the product and diluting it to below 68% sugar solids (so that moulds and yeasts can grow). Too cold filling carries the danger of microbiological contamination from the jar etc.

Cap the jars quickly using either screw type or 'Omnia' type push-on lids. When the jars have cooled and a vacuum has formed (about 50°C) rinse them in a bath of clean chlorinated water - one tablespoon of bleach per 4.5 litres of water.

Dry the jars and label (see the technical brief on labelling for more details of the legal requirements for food labels).

### 4. Storage

If properly preserved and packaged in glass, marmalade can be stored for up to one year away from direct sunlight. If it is packaged in plastic bottles, it can only be stored for about 4-6 months.

## Equipment required

- pH meter (optional)
- Juice extractor
- Peeler
- Knives
- Plastic buckets
- Stainless steel pan
- Wooden spoons
- Gas ring or other heat source

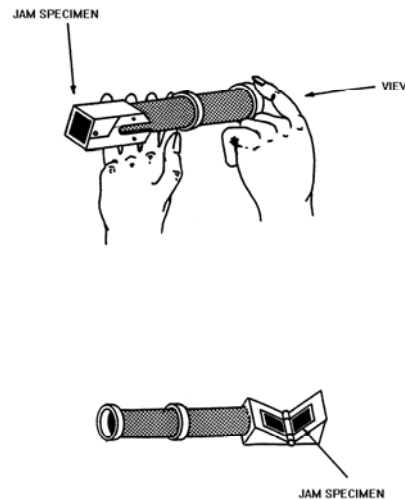


Figure 3: Refractometer

Jam thermometer or refractometer  
Capping machine  
Jar cooler (optional)

### Equipment suppliers

Note: This is a selective list of suppliers and does not imply endorsement by Practical Action

### Cutting and slicing equipment

A range of manual and powered cutting and slicing machinery is available.

#### Eastend Engineering Company

173/1 Gopal Lal Thakur Road  
Calcutta 700 035  
India  
Tel: +91 33 2553 6397

#### Narangs Corporation

P-25 Connaught Place  
New Delhi 110001  
India  
Tel: +91 11 2336 3547  
Fax: +91 11 2374 6705

#### Gardners Corporation

158 Golf Links  
New Delhi 110003  
India  
Tel: +91 11 2334 4287/2336 3640  
Fax: +91 11 2371 7179

### Juice filters, strainers and sieves

A range of filtering and straining equipment can be used. The simplest is the filter bag (or jelly bag) made of terylene or muslin cloth. More sophisticated are the filter presses and strainers which may be mechanised.

#### Gauthier

Parc Scientifique Agropolis  
34397 Montpellier  
Cedex 5  
France  
Tel: +33 4 67 61 11 56  
Fax: +33 4 67 54 73 90

#### Alvan Blanch

Chelworth  
Malmesbury  
Wiltshire  
SN16 9SG  
United Kingdom  
Tel: +44 (0) 666 577333  
Fax: +44 (0) 666 577339  
E-mail: [info@alvanblanch.co.uk](mailto:info@alvanblanch.co.uk)  
Website: <http://www.alvanblanch.co.uk>

#### Lakeland Mail order kitchenware

38 Alexandra Buildings  
Windermere  
LA23 1BQ  
United Kingdom  
Tel: +44 (0)15394 88100  
Website: [www.lakeland.co.uk](http://www.lakeland.co.uk)

#### Gardners Corporation

India (see above)

### Weighing machines

It is important to have accurate weighing machines. Quite often more than one machine is required - a large one to weigh the fruit and a small one for weighing out the dry ingredients such as pectin and spices.

#### Fischer Scientific

#### Essae-Teraoka Ltd

Bishop Meadow Road  
Loughborough  
LE11 5RG  
UK  
Tel: +44 1509 231166  
Fax: +44 1509 231893  
Email: [fisher@fisher.co.uk](mailto:fisher@fisher.co.uk)  
Web: [www.fisher.co.uk](http://www.fisher.co.uk)  
**Alvan Blanch**  
UK (see above)

**Gardners Corporation**  
India (see above)

### Juice extractors and pulpers

A variety of juice extractors and pulpers is available from a wide range of suppliers. They are available in different capacities and either manual or powered (either electric or diesel).

**Kenwood Limited**  
New Lane  
Havant  
Hampshire  
PO9 2NH  
United Kingdom  
Tel: +44 (0) 23 9247 6000  
Fax: +44 (0) 23 9239 2400  
Website: <http://www.kenwood.co.uk>

**Alvan Blanch**  
UK (see above)

**Robot Coupe**  
12 Avenue Cal Leclerc  
BP 134  
71303 Montceau-les-Mines  
France  
Tel: +33 3 85 58 80 80

**DISEG (Diseno Industrial y Servicios Generales)**  
Av Jose Carlos Mariategui 1256  
Villa Maria del Triunfo  
Lima  
Peru  
Tel: +51 14 283 1417

**Servifabri SA**  
JR Alberto Aberd  
No. 400 Urb Miguel Grau (ex Pinote)  
San Martin de Porres  
Lima  
Peru  
Tel: +51 14 481 1967

**Bajaj Machine Private Limited**

377/22 6<sup>th</sup> Cross Wilson Garden  
Bangalore 560027  
India  
Tel: =91 80 2216185/2241165

**Narangs Corporation**  
India (see above)

**Lehman Hardware and Appliances Inc.**  
P.O. Box 41  
Kidron  
Ohio 44636  
USA  
Tel orders: +1 877 438 5346  
Tel enquiries: +1 888 438 5346  
E-mail: [info@lehmans.com](mailto:info@lehmans.com)  
Website: <http://www.lehmans.com>

**Eastend Engineering Company**  
India (see above)+

**Florachem**  
Flat No. 1119, Hemkunt Chambers, 89,  
Nehru Place  
New Delhi 110019  
India  
Tel: +91 11 25589502

**Gardners Corporation**  
India (see above)

**Food Packs Indiana**  
Thrikkariyoor, Kothamangalam, Ernakulam  
Kerala 686692  
India  
Tel: +91 485-2522134, 2523610

**Geeta Food Engineering**

technical brief

7/20, 7/27, Jai Lakshmi Industrial Estate,  
Side-IV  
Sahibabad Industrial Area  
Ghaziabad-201301  
U.P  
India  
Tel: +91 120 22775119/22775137  
Fax: +91 120 22775137  
Website: [www.indiamart.com/bajajmachine](http://www.indiamart.com/bajajmachine)

**Buhler (India) Pvt Ltd**  
13-D, K A I D B Industrial Area, Attibele  
Bangalore  
Karnataka 562107  
India  
Tel: +91 80- 27820000  
Fax: +91 80-7820001  
Website: [www.buhlergroup.com](http://www.buhlergroup.com)

**Delhi Industries**  
4 Paharganj Lane,  
New Delhi 110055  
India  
Tel: +91 11 2529720, 27525200,  
27536888  
Fax: +91 11 25791291

**Do-All-Engineering Industries**  
87/12, Industrial Suburb, Yeshawanthpur  
Bangalore  
Karnataka 560022  
India  
Tel: +91 80 23345754, 23372298  
Fax: +91 80 23346138

**Udaya Industries**  
Uda Aludeniya, Welligalla  
Gampola  
Sri Lanka  
Tel: +94 8 388586  
Fax: +94 8 388909

**Mark Industries (Pvt) Ltd**  
348/1 Dilu Road  
Mokbazar  
Dhaka 1000  
Bangladesh  
Tel: +880 2 9331778/835629/835578  
Fax: +880 2 842048  
Email: [markind@citechco.net](mailto:markind@citechco.net)

Plot No C-7/1 TTC Area  
Pawana MIDC Thane Belapur Road  
Behind Davita Chemicals Ltd  
Navi Mumbai 400 705  
India  
Tel: +91 22 2782 6626/2766 2098  
Fax: +91 22 2782 6337

**Narangs Corporation**  
India (see above)

**Praj Industries Ltd**  
Praj House Bavdhan  
Pune, Maharashtra 411021  
India  
Tel: +91 20-22951511, 22952214  
Fax: +91 20-22951511 / 22952214  
Website: [www.praj.net](http://www.praj.net)

**Techno Equipments**  
Saraswati Sadan  
1<sup>st</sup> Floor, 31 Parekh Street  
Mumbai 400004  
India  
Tel: +91 22 2385 1258

**Kundasala Engineers**  
Digana Road  
Kundasala  
Kandy  
Sri Lanka  
Tel: +94 8 420482

technical brief

**For boiling**

Boiling pans should be made of aluminium, enamelled metal or stainless steel. For larger quantities it is necessary to buy equipment which does not cause burning or sticking of the product to the bottom of the pan. Stainless steel steam jacketed kettles, which are double walled pans are suitable for boiling large quantities of jam and are available in a range of sizes (from 5 to 500litres).

**Gardners Corporation**

India (See above)

**HRS Process Systems Pvt Ltd**

Asia Division, Praj House,  
Bavdhan, Pune  
Maharashtra 411021  
India

Tel: +91 20- 22951511

Fax: +91 20- 22951718

Website: [www.hrsasia.co.in](http://www.hrsasia.co.in)

**Raylons Metal Works**

Kondivita Lane  
J. B. Nagar Post Office  
Post Box No. 17426  
Andheri (E) Andheri - Kurla Road,  
Mumbai - 400 059  
India  
Tel: +91 22 26323288 / 6325932

**Sri Rajalakshmi Commercial Kitchen Equipment**

No.57, (old No. 30/1) Silver Jubilee Park  
Road  
Bangalore - 560 002  
India  
Tel: +91 (0)812 2222 1054/223 9738  
Fax: +91 (0)812 2222 2047

**United Engineering (Eastern) Corporation**

Shantiniketan Site No.2 & 3  
(10<sup>th</sup> Floor) 8 Camac Street  
Kolkata, West Bengal 700017  
India  
Tel: +91 33-22823914, 22820157  
Fax: +91 33-22823742

**Bottle filling and packaging equipment****H Erben Limited**

Lady Lane  
Hadleigh  
Suffolk  
IP7 6AS  
United Kingdom  
Tel: +44 (0)1473 823011

**Alvan Blanch**

United Kingdom (See above)

**Israel Newton Limited**

Summerley Works  
All Alone Road  
Bradford  
West Yorkshire BD10 8TT  
United Kingdom  
Tel: +44 (0)1274 612059  
Fax:+44 (0)1274 612059

**APV Baker Limited**

Manor Drive  
Paston Parkway  
Peterborough  
Cambridgeshire  
PE4 7AP  
United Kingdom  
Tel: +44 (0)1733 283000  
Fax: +44 (0)1733 283005

**T Giusti and Son Limited**

Rixon Road, Finedon Road Industrial Estate  
Wellingborough,  
Northamptonshire NN8 4BA  
United Kingdom  
Tel: + 44 (0)1933 229933  
Fax: + 44 (0)1933 272363  
Website: [www.giusti.co.uk](http://www.giusti.co.uk)

**Orbit Equipments Pvt Ltd**

175 - B, Plassy Lane  
Bowenpally  
Secunderabad - 500011, Andhra Pradesh  
India  
Tel: +91 40 32504222  
Fax: +91 40 27742638

**technical brief**



Fax: +44 (0)1473 828252  
 Website: <http://www.erben.co.uk>

#### **Sussex and Berkshire Machinery Company PLC**

Blacknest  
 Alton, Hants GU34 4PX  
 United Kingdom  
 Tel: + 44 (0)1420 22669  
 Fax: + 44 (0)1420 22687  
 E-mail: [technical@sabplc.uk](mailto:technical@sabplc.uk)  
 Website: <http://www.sabplc.co.uk/>

#### **Acufil Machines**

S. F. No. 120/2, Kalapatty Post Office  
 Coimbatore - 641 035  
 Tamil Nadu, India  
 Tel: +91 422 2666108/2669909  
 Fax: +91 422 2666255  
 Email : [acufilmachines@yahoo.co.in](mailto:acufilmachines@yahoo.co.in),  
[acufilmachines@hotmail.com](mailto:acufilmachines@hotmail.com)  
<http://www.indiamart.com/acufilmachines/#products>

#### **Autopack Machines Pvt Ltd**

101-C Poonam Cambers  
 A Wing, 1<sup>st</sup> Floor  
 Dr Annie Besant Road, Worli  
 Mumbai 400018  
 India  
 Tel: +91 22 2493 4406/2497 4800/2492 4806  
 Fax: +91 22 2496 4926  
 E-mail: [autopack@bom3.vsml.net.in](mailto:autopack@bom3.vsml.net.in)  
[www.autopackmachines.com](http://www.autopackmachines.com)

#### **Bombay Engineering Industry**

R NO 6 (Extn) Sevantibai Bhavan  
 Chimatpada  
 Marol Naka Andheri (East)  
 Mumbai 400059  
 India  
 Tel: +91 22 2836 9368/2821 5795  
 Fax: +91 22 2413 5828

#### **MMM Buxabhoj & Co**

140 Sarang Street  
 1<sup>st</sup> Floor, Near Crawford Market  
 Mumbai, India  
 Tel: +91 22 2344 2902  
 Fax: +91 22 2345 2532  
[yusufs@vsnl.com](mailto:yusufs@vsnl.com); [mmmb@vsnl.com](mailto:mmmb@vsnl.com);  
[yusuf@mmb.in](mailto:yusuf@mmb.in)

#### **Gardners Corporation**

India (see above)

#### **Gurdeep Packaging Machines**

Harichand Mill compound

Website : <http://www.orbitequipments.com>

#### **Pharmaco Machines**

Unit No. 4, S.No.25 A  
 Opp Savali Dhaba, Nr.Indo-Max  
 Nanded Phata, Off Sinhagad Rd.  
 Pune – 411041, India  
 Tel: +91 20 65706009  
 Fax: +91 20 24393377

#### **Rank and Company**

A-p6/3, Wazirpur Industrial Estate  
 Delhi – 110 052  
 India  
 Tel: +91 11 27376101  
 Fax: +91 11 7234126  
[Rank@poboxes.com](mailto:Rank@poboxes.com)

#### **Banyong Engineering**

94 Moo 4 Sukhaphibaon No 2 Rd  
 Industrial Estate Bangchan  
 Bankapi  
 Thailand  
 Tel: +66 2 5179215-9

#### **Alfa Technology Transfer Centre**

301 Cach Mang Thang 8  
 Tan Binh District  
 Ho Chi Minh City  
 Vietnam  
 Tel: +84 8 9700868  
 Fax: +84 8 8640252

#### **Technology and Equipment Development Centre (LIDUTA)**

360 Bis Ben Van Don St  
 District 4  
 Ho Chi Minh City  
 Vietnam  
 Tel: +84 8 9400906  
 Fax: +84 8 9400906

#### **Mark Industries (Pvt) Ltd**

Bangladesh (See above)

#### **John Kojo Arthur**

University of Science and Technology

technical brief

LBS Marg, Vikhroli  
Mumbai 400 079  
India  
Tel: +91 22 2578 3521/577 5846/579 5982  
Fax: +91 22 2577 2846

Kumasi  
Ghana

**Eastend Engineering Company**  
India (See above)

**Alvan Blanch**  
UK (see above)

**Narangs Corporation**  
India (see above)

### Refractometers

The refractometer is used to measure the sugar content.

**Bellingham + Stanley Ltd.**  
Longfield Road, North Farm Industrial Estate  
Tunbridge Wells, Kent TN2 3EY  
United Kingdom  
Tel: +44 1892 500400  
Fax: +44 1892 543115  
E-mail: [sales@bs-ltd.com](mailto:sales@bs-ltd.com)  
Website: <http://www.bs-ltd.com>

**International Ripening Company**  
1185 Pnieridge Road  
Norfolk  
Virginia 23502-2095  
USA  
Tel: +1 757 855 3094  
Fax: +1 757 855 4155  
Email: [info@QAsupplies.com](mailto:info@QAsupplies.com)  
Web: [www.qasupplies.com](http://www.qasupplies.com)

**Fisher Scientific UK Ltd**  
UK (see above)

**Gardners Corporation**  
India (see above)

### References and further reading

#### Practical Action Technical Briefs

- Fruit waste utilisation
- Jams, jellies and marmalades
- Food labelling
- How to carry out a feasibility study

This document was produced by Dr. S Azam Ali for Practical Action March 2007. Dr. S Azam-Ali is a consultant in food processing and nutrition with over 15 years experience of working with small-scale processors in developing countries.

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Website: <http://practicalaction.org/practicalanswers/>

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