



East, Central and Southern African  
Health Community

# MANUAL FOR INTERNAL MONITORING OF SALT FORTIFIED WITH IODINE

(Quality Assurance and Quality Control, QA/QC)

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COMMUNITY (ECSA-HC)**

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## Foreword

Over the last five years, the East, Central and Southern African Health Community (ECSA-HC) has continued to undertake advocacy and technical assistance to assist member countries to embrace and scale up food fortification initiatives as a key strategy to reduce micronutrient malnutrition in the region.

ECSA has been working with partners in direct response to resolutions of the Conference of Health Ministers to scale up food fortification initiatives as a critical strategy in fighting the devastating effects of micronutrient malnutrition among populations of member states. ECSA partners in the Regional Food Fortification Initiative include the A2Z Project, USAID, UNICEF, Micronutrient Initiative (MI), and ICCIDD, among others.

Part of the outcome of the intensified collaborative initiative, is a series of fortification guidelines developed to guide the industry during the fortification process of staple foods and provide government food inspectors a reference point in enforcing the standards.

Similarly, food control manuals have been developed for the Industry and the Government to provide technical reference resources that cover the entire fortification process to ensure that the fortified foods are safe and adequately fortified with the required fortificants.

This manual is part of a series of manuals on food fortification and is meant to directly contribute to the overall effort to strengthen food fortification in the region.

It is our hope that the use of this manual will help strengthen food control activities in our countries in order to deliver safe and quality fortified foods to the ECSA population.

Steven Shongwe  
Executive Secretary  
ECSA Health Community

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The manual is as a result of joint work by distinguished food fortification experts in developing countries. During the drafting of this manual, consultations with senior officers from food control departments of the ECSA member states were made and input incorporated.

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ECSA is deeply thankful to the above authors for preparing this manual.

### ***Disclaimer***

*The content of this manual can be adapted to suit country specific contexts. In such a case, the content of the resulting document will be the sole responsibility of the organization adapting the manual and will not represent the views of the authors and that of the ECSA-HC. The Use of the content of this manual should be duly acknowledged.*

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## **MANUAL FOR INTERNAL MONITORING OF SALT FORTIFIED WITH IODINE (Quality Assurance and Quality Control, QA/QC)**

Salt producers and importers play a key role in the control of iodine deficiency at a country because they are responsible for making sure that the salt reaching the consumers contains iodine in the specified amounts. Quality control and assurance activities are vital during salt fortification in order to ensure that the fortified salt meets the requirements established in regulations and standards, from production level to the market and finally the consumer. Quality assurance and quality control (QA/QC) for salt fortification does not require the implementation of a new program in factories, but only to incorporate into the ongoing QA/QC procedures those aspects that are specific to salt fortification. In any case, it requires the support and commitment of the general management to provide the human and financial resources to implement the new activities, and maintain acceptable levels of performance.

The fortification of salt with iodine involves the blending of an appropriate iodine compound with salt. Commonly used carriers are potassium iodate and potassium iodide usually sold in fibre drums containing the salt sealed in heavy duty polyethylene bags. Potassium iodate is the preferred form because of its relative stability in salt samples that are not highly refined and contain moisture up to 5%. Salt that is suitable for potassium iodide should ideally have high purity above 99.5% and a moisture level below 0.1%. Salt of this high purity is rarely available from manufacturers in many developing countries where the iodine deficiency is a major problem. The humidity and hot climate in many countries is also not conducive to the preservation of iodine in salt when iodide is used. Irrespective of the iodine carrier used, the iodine content in the salt is to be expressed in terms of iodine.

There are two main procedures for fortifying salt with potassium iodate or potassium iodide namely: (a) Dry mixing and (b) wet mixing. With dry mixing the fortificant is mixed with filler compound such calcium carbonate or dry salt. Typically this mixing is in the ratio of 1:9 (potassium iodate:filler). This premix is then diluted approximately 1:1500 for salt containing 40 mg/kg of iodine, or 1:1200 (for salt containing 50 mg/kg of iodine, or the needed proportion to reach the specified fortification level. The wet mixing involves the preparation of a solution “premix” which is dripped over the salt as it flows or sprayed onto salt as it moves along a conveyor belt or a sprayed onto a batch of salt that is then mixed in a blender. The spraying technique requires provision of a reservoir for storing the solution premix, filtered distilled water, a pump

to create pressure for spraying the solution and preferably a dryer to reduce moisture content resulting from the spraying process. Wet solution dripping is ideal for coarse salt of diameter greater than 1cm and high moisture levels up to 5%. The spraying method is more relevant for situations where the particle size and moisture levels of the salt to be fortified varies widely as is common in cases where the salt is sourced from various salt plants. Dry mixing is effective for refined salt that is fine and dry with grains of diameter less than 2 mm so that it can mix well with the fine grains of the fortificant premix.

Typical concentrations of iodate solutions range from 25 to 50 grams of iodine per liter and the application rate varies depending on the flow rate of the salt in continuous processes or the batch size in cases where the fortification is done per batch. A solution containing 30 g/L (3% iodine, or 5% as potassium iodate solution) would increase the moisture content by less than 0.2%, which is low. Salt iodization plants vary greatly in terms of capacity to fortify and volumes fortified over a period of time and so appropriate solution strengths and dilutions need to be determined on an individual basis.

The consistent preparation of the premix as well as the blending of the salt with the premix requires adherence to quality assurance and quality control measures. It is important to identify the causes of non-compliance and where necessary implement corrective and preventive measures as soon as possible. The relevant measures put in place need to be documented and records of activities performed updated so that they can be available to inspection personnel at any given time. The inspection personnel such as national health authorities have the duty to visit salt factories to carry out technical audits and inspection of the fortification process and product. These government activities are mainly centered

on checking the producer's records and so it is important to keep in mind that "what has not been recorded has not been done".

The following sections are included in this manual:

Quality assurance of the iodine compound receipt, storage and delivery

Quality assurance of the salt fortification process

Quality control of the fortified salt

Methods for determining iodine levels in fortified salt, both for iodate and iodide



## A. QUALITY ASSURANCE OF THE POTASSIUM COMPOUND RECEIPT, STORAGE AND DELIVERY

### I. Objectives and Accountability

The purpose of the Quality Assurance of the fortificant receipt, storage and delivery are to ensure that:

The factory always has enough iodine salt (potassium iodide or iodate) in stock for at least 3 months of production of fortified salt.

The iodine compound is stored under adequate conditions and is used based on the “first-in, first-out”, as determined by the expiration date.

Those directly responsible for achieving these objectives are the *Warehouse Manager* and the *Head of the Quality Control Department*, who should frequently inform the *Factory Manager*.

### II. Procedures

#### 1.0 Receipt and Storage (warehouse)

1. Every time a new lot of the iodine compound is received in the factory, check that the containers are hermetically sealed and that a Certificate of Analysis (COA) has been included.
2. Record in a form similar to **Table A-1** the number of containers drums received, lot numbers, date of expiration, and the name of the person who is receiving the delivery.
3. Store the containers in a clean dry area and away from chemical products or other potential contaminants. If possible, store the drums of iodine fortificant in an air conditioned room.
4. Store the containers in such a way that the first received are used first, following the “first-in, first-out” system.

## **2.0 Delivery (warehouse)**

5. When container is dispatched to the fortification personnel, record the date of dispatch and name of the person who is receiving the order, as shown in **Table A-2**.
6. Send a copy of the log form every week to the Quality Control Department and the Production Manager.

## **3.0 Confirming content of iodine in the fortificant (Quality Control Department)**

7. At least once a week, an employee of the Quality Control Department shall visit the warehouse and the fortification area to ensure that the iodate/iodide compound is being used in the correct order, and that all records are kept up to date. Reviewer must sign in last column of **Table A-2**.
8. At least once a month, take two 25 g samples from each drum of the iodine compound that will be used on the day of sampling. Package them in opaque airtight containers and send them to an external laboratory to confirm the iodine content using the quantitative titration with thiosulphate.
9. When the result are available report to the Production Manager for inclusion in appropriate A-1 form.
10. If the results are below the claimed content on the Certificate of Analysis, contact the iodine supplier.

## **III. Records and Reporting**

Warehouse responsible should keep updated all the records, which should be periodically reviewed by personnel from the *Quality Control Department*. Weekly reports should be sent to the *Factory Manager* and the Quality Control department, where the reports will be filed, too.

## B. QUALITY ASSURANCE OF THE SALT FORTIFICATION PROCESS

### I. Objectives and Accountability

The purpose of Quality Assurance of the salt fortification process is to ensure that:

- The iodine compound is properly diluted either in water or mixed with a dry filler to produce an appropriate premix.
- Equipment for volume determinations and for solution preparations is adequate and weighing equipment is in good order.
- Spraying or feeder equipment is properly serviced to ensure consistent results.
- Ratio salt produced (kg)/iodine fortificant (kg) is close to the theoretical ratio based on quantities used and dilutions effected.

The responsible people for this component are the *production personnel* assigned to the area where fortification and packaging are taking place, led by the *Production Manager*. *Quality Control Department* is in charge of supervising the activities and daily or weekly reporting to the *Factory Manager*.

### II. Procedures

#### 1.0 Calculating the amount of iodine compound per batch or tonnage of fortified salt (Production Manager)

The amount of iodine compound will depend on process used and dilution factors involved as well as the final concentration according to standards. Some physical parameters relating to the potassium iodate and potassium iodide are provided in the table below. It is evident that potassium iodide is more soluble than potassium iodate and contains more iodine per given weight of the two salts. Iodate is usually used for the dry or wet processes or salt that are not highly refined, and iodide for the wet process of refined salt.

	Solubility g/L			% Iodine in Salt
	20°C	30°C	40°C	
Potassium Iodate	81.3	117	128	59.5
Potassium Iodide	1440	1520	1600	76.5

**a. Dry Mixing, Batch Process**

Prepare the premix for dry mixing by mixing potassium iodate with a filler in a ratio of 1:9 (1 part of the iodate salt and 9 parts of the filler). Fillers can be calcium carbonate or the same dry salt. This premix should have an iodine content of about 60 g/kg. Another alternative is to weight 8.4 kilograms of potassium iodate and add sufficient filler up to 100 kilograms. The content of iodine in the second premix should be 50 g/kg.

**b. Drip Feed and Spray Mixing Process**

The addition rate of the drip-feed or spraying process depends on the final iodine content and weight of fortified salt flowing per specific period or the weight of fortified salt per batch. In the case of a production of 5 tons (5,000 kilograms) per hour the solution has to contain enough iodine to fortify the salt to the appropriate level.

Use the following equation to determine the spraying rate or the dripping feed rate

$$\text{The flow rate of premix solution (liters per hour) =} \\ \frac{[\text{Mass of Salt to fortify (tons/hour)} \times \text{Fortification level (mg/kg)}] \div (\text{Iodine conc. in premix solution (g/L)})$$

Assuming a fortification level of 50 ppm (50 mg/kg), the 5 tons would require 250 g of iodine to be sprayed or drip fed over a period of 1 hour. If the iodine concentration in the premix solution is 50 g/L, the system would have to be set in such a way as to deliver 5 liters of the premix solution per hour, according to the equation above. If more than 5 liters is delivered within an hour the salt would be over-fortified and if the delivery is less than 5 liters the salt would be under-fortified according to a 50 ppm standard.

The concentration of the premix is usually constant, but the flow rates per hour of the salt may vary. Thus, adjustments must be done to the addition of the premix rate. In order to prepare the premix solution, estimations of the amount of the iodine compound must be done. In the case of potassium iodate, a solution of 50 g/L of iodine should require 84 grams (i.e. 50 g / 0.595) per liter, while for potassium iodide the amount is 65 grams (i.e. 50 g / 0.765). The water should be potable and preferable distilled.

## **2.0 Preparing Premix (Production Personnel)**

The production personnel in charge of the preparation of the premix should follow strictly the instructions of the factory manger, and record the work done in **Table B-1**. Data should always be ready to show to the Quality Control Department when requested. When a form is completely filled-out, send a copy to the Quality Control department.

On a weekly basis check the performance of the blenders, balance, pump, drier and the integrity of the spraying equipment. Record the results of this activity in **Table B-2**.

## **3.0 Records of Production (Production Personnel)**

The production personnel should also keep up-dated all the information about premix used and amount of salt produced during each shift. Send report to the Quality Control Department at the end of each shift.

## **4.0 Collecting Samples for Quality Control(Packaging Department)**

Collect 500 g of salt every hour, and place inside an opaque 5-kg container. Detect the presence of iodine using a qualitative test (e.g. the Rapid Test Kit) to assure that the iodine premix is being added constantly in the process. When the shift (8-hours) ends, mix well the single samples to prepare a composite sample, and label it with the date, hour and number of batch or batches. Include the amount of salt (in kilograms) produced in the period, as well as the amount of premix that was used. Send sample to the laboratory.

## **III. Records and Reporting**

The Production department should keep updated and adequately filed records of the calculations done, amounts of salt produced and amounts of fortificant used, as well as description of actions taken during production to keep the fortification process performing as expected. A copy of these records will be sent daily to the Quality Control Department.

## C. QUALITY CONTROL OF FORTIFIED SALT

### I. Objectives and Accountability

The purpose of Quality Control of the fortified salt is to ensure that:

- All salt samples contain iodine levels > 20 mg/kg (or whatever is the regulatory minimum).
- 80% samples have iodine levels within the factory level (e.g. 30 to 60mg/kg) and the average concentration is close to the addition level at the factory (e.g. 45 mg/kg).
- Fortified salt is packaged and labeled as required in the National Standards for General Labeling of Prepackaged Foods and the Salt Fortification Regulations.

The responsibility for this component is the *Quality Control Department*, which should send daily reports to the *Production Manager*.

### II. Procedures

#### a. Supervision and sampling (Quality Control Department)

1. Make unannounced visits to the storage facility to check that the operators are following instructions and the records are being filled out timely. Sign **Table A-2** to confirm completion of this supervision.
2. Make unannounced visits to the fortification section to check that the operators are following instructions and the records are being filled out timely. Sign **Table B-1** to confirm completion of this supervision.
3. Make unannounced visit to the packaging site to verify that the operators are taking 500g of salt every hour, and that they are preparing a composite sample per shift, and labeling as expected.

#### b. Iodine determination (Laboratory)

4. In the laboratory, mix well the composite samples. Determine the iodine concentration using the quantitative titration method (see **Sections D** and **E** for the Analytical Methods).

5. Record results in the chart of **Table C-1**, expressing them in terms of milligrams iodine per kilogram of salt.
6. Prepare a **daily** composite sample, mixing 500 g from each of the samples collected on each shift. Mix well. Determine the content of iodine, and record result in **Table C-1**. Store the remaining daily-composite sample in an air-tight and opaque container. Identify the sample with the date, and include the amount of iodine from quantitative testing. Keep this sample in the sample-store room for up to a month.
7. If abnormalities are found, discuss immediately with the Production Manager the suitable corrective actions.

### **III. Records and Reporting**

8. Complete **Table C-1** with the data provided by the production department.
9. Calculate the ratio salt produced/premix used, expressed in kilograms of salt over kilograms or liters of premix. The ratio should be close to 1,000 if a premix of 50 g/kg (or 50 g/L) was used to produce iodized salt at 50 mg/kg. Factory manager should calculate the adequate figures if the conditions are different.
10. Record all the needed information in **Table C-1**, and on a daily basis send a copy to the production manager.
11. At least once a month, select randomly two daily-composite samples from the sample store and send a portion of those to an external reference laboratory for the quantitative determination of iodine.
12. Once results are received, record those in the corresponding **Table C-1**. Compare the results with your own data, and if incompatibility is found look for the reason, and apply corrective measures as needed.
13. Send reports to the production manager about corrective actions or confirmation of the earlier findings and deductions from the work of the Quality Control Department.

**D. QUANTITATIVE TITRIMETRIC METHOD TO DETERMINE IODINE FROM IODATE IN SALT**

**I. References**

AOAC Official Methods of Analysis. 1984. Section 33, 147.

**II. Principle**

Iodine is added to salt in the form of potassium iodate (KIO<sub>3</sub>). To determine the concentration of the added iodate, the salt is dissolved in slightly acidic solution to which excess potassium iodide (KI) is added. The iodate from the salt reacts with iodide (I<sup>-</sup>) to form iodine (I<sub>2</sub>) and triiodide (I<sub>3</sub><sup>-</sup>), which is very soluble in water. A yellow color is formed. If a starch solution is added, a blue colored complex is then formed with triiodide. The amount of iodine in solution is determined by a colorimetric titration with a standard thiosulphate solution, which removes the iodine, and hence the disappearance of the blue color. The end point is visually determined by the disappearance of the blue color when no more iodine is present.

The related chemical equations are various steps are as follows:

***Formation of iodine from the iodate in salt solution***



***Formation of blue complex of starch and triiodide***



***Reduction of iodine by thiosulphate***



The combination of equations implies that one equivalent of iodate (IO<sub>3</sub><sup>-</sup>) reacts with 6 equivalents of thiosulphate. Therefore, in terms of weight, one equivalent of thiosulphate means 35.6667 grams of potassium iodate (FW/6 = 214/6), or 21.222 grams of iodine, knowing that potassium iodate contains 59.5% iodine.



### III. Critical Points and Cautions

The starch solution should be freshly prepared because it is easily destroyed by microorganisms. In any case, each time that the method is used, a control sample of iodized salt with a known amount of iodine should be analyzed first to confirm its reliability.

### IV. Equipment and Materials

- Beaker (250-500 mL)
- Burettes or graduated pipettes (to measure 10-50 mL)
- Glass rods
- Graduate cylinder (50 mL)
- Containers calibrated by volume to weigh approximately 10 g of salt.
- Graduated pipettes, 1 to 5 (5 mL)

### V. Reagents

- **0.005-N Sodium Thiosulfate Solution:** Dissolve 1.24 g  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  (FW= 248) in one liter of distilled water and store in a cool dry place. Solution is stable for 1 month. This amount is sufficient for about 200 samples.
- **2-N Sulfuric Acid Solution:** Using concentrated sulfuric acid, slowly add 60 mL to 900 mL of distilled water and mix. The solution is cooled down and made up to one liter. This amount is sufficient for about 1,000 samples.
- **10% Potassium Iodide:** Dissolve 100 g of potassium iodide in water and make up to one L. Store in a cool dark place. This solution is stable for 6 months provided there is no color change. This amount is sufficient for about 200 samples.
- **Starch Solution:** Weigh 1 gram of soluble starch into a 100 mL beaker and add 10 mL of water, heat to dissolve. Prepare a saturated solution of sodium chloride dissolving NaCl in 80 mL of distilled water, heat up the solution until no more NaCl dissolves. Cool the solution and add to the dissolved starch and make up to 100 mL. Store in a cool dark place. This amount is sufficient for about 50 samples. Prepare the starch solution every day. The saturated NaCl solution is stable for 12 months.

## **VI. Procedure**

### **a. Solubilization of the salt sample**

1. Mix well the sample of salt and weigh accurately 50 g and dissolve in a 250 mL beaker. Transfer to 250 ml volumetric flask and fill to the mark.
2. Transfer 50 mL of the salt solution to a 200 mL Erlenmeyer flask 3. Using a graduated pipette, add 1 mL of the 2-N sulphuric acid to the salt solution and mix thoroughly.
4. Add 5 mL of the 10% potassium iodide solution using a measuring cylinder or a pipette. If iodine is present a yellow solution is formed.
5. Cover the flask and put in the dark or in a cupboard for 10 minutes.

### **b. Titrating iodine in the salt solution**

6. Fill the 50 mL burette with the thiosulphate solution in readiness for titration.
7. Titrate the iodine solution in the flask with the thiosulfate and stop the titration when the dark color of the solution turns to pale yellow. Agitate the salt solution continuously.
8. Add 2 mL of the starch solution and the solution should turn blue. Agitate.
9. Resume titration with thiosulfate until the blue color disappears. Agitate the salt solution continuously and gently.
10. Record the volume from the burette or serologic pipette as accurately as possible to the nearest 0.1 mL.

## VII. Calculations

1. The amount of potassium iodate in the salt is determined using the following equation.

$$\text{Iodine in salt (mg/kg)} = \frac{[(\text{N-thiosulphate}^1 \times \text{volume thiosulphate (mL)} \times 21.222 \text{ g/Eq. Iodine}) \times \text{Final volume/used volume}] \div \text{Weight of salt (kg)}}$$

If the procedure is strictly followed, the prior equation can be simplified to:

$$\begin{aligned} \text{Iodine in salt (mg/kg)} &= [0.005 \text{ N} \times \text{volume thiosulphate (mL)} \times 21.222 \text{ g/Eq. Iodine}] \times 250/50 \div 0.05 \text{ kg} = \\ \text{Iodine in salt (mg/kg)} &= 10.61 \times \text{volume thiosulphate (mL)} \end{aligned}$$

The following chart presents the equivalences between volume of the thiosulphate solution used and the amount of iodine in salt, under those conditions.

<sup>1</sup> The accurate normality of the thiosulphate solution can be determined by titrating a solution of potassium iodate at 0.005-N, i.e. 0.17834 g/L, and which may be prepared diluted 1:100 a solution 0.5 N-potassium iodate (17.834 g/L). Normality of thiosulphate = [volume KIO<sub>3</sub> (sol)/ volume thiosulphate (sol)]/ x 0.005 N

## E. QUANTITATIVE TITRIMETRIC METHOD TO DETERMINE IODINE FROM IODIDE IN SALT 2

### I. Principle

*The method for the determination of iodide in salt is similar to the methods for iodate determination except that it is preceded by the oxidation of iodide to iodate using bromine water. Excess bromine water is added to the iodide solution and any excess is destroyed using sodium sulphite and phenol solutions.*

### II. Reagents

In addition to the reagents listed in the method for determination of iodine from iodate, the following are also necessary:

- **Saturated Bromine Water:** The approximate concentration in mg/L is determined by reacting a known volume of the solution with excess KI solution. The released iodine which corresponds to the bromine in solution is titrated using standard 0.1N thiosulphate solution. Add 5 mL of 10% KI and 5 mL of dilute sulphuric acid to a conical flask.

Add the bromine solution from a burette and titrate the iodine using starch as an indicator. 1 mL of the 0.1N  $\text{Na}_2\text{S}_2\text{O}_3$  = 8 mg of bromine = 12.7 mg of iodine.

- **Sodium sulphite, 1 % (m/v)** Dissolve 1 g of  $\text{Na}_2\text{S}_2\text{O}_3$  and dissolve in distilled water and dilute to 100 mL water
- **Methyl orange** — Dissolve 0.01 g methyl orange in water and dilute to 100 mL.
- **Phenol solution 5 % (m/v)**, dissolves 5 g of phenol in water and dilute to 100 mL

<sup>2</sup> An alternative method is using specific electrodes for iodide.

### III. Procedure

#### a. Oxidation of iodide to iodate

1. Mix well the sample of salt and weigh accurately 50 g and dissolve in a 250 mL beaker. Transfer to 250 mL volumetric flask and fill to the mark.

2. Transfer 50 mL of the salt solution to a 200 mL Erlenmeyer flask. Neutralize with 2-N sulphuric acid, using methyl orange as an indicator.
3. Add bromine water drop-wise from a burette in a quantity equivalent to 10 mg of bromine.
4. Allow the solution to stand for a few minutes and add 1 % sodium sulphite drop wise while mixing to destroy most of bromine.
5. Wash down the neck and sides of the flask with water and complete the destruction of bromine by adding 1 or 2 drops of 5 % phenol.

**b. Determination of iodine from iodate**

6. Using a graduated pipette, add 1 mL of the 2-N sulphuric acid to the salt solution and mix thoroughly.
7. Add 5 mL of the 10% potassium iodide solution using a measuring cylinder or a pipette. If iodine is present a yellow solution is formed.
8. Cover the flask and put in the dark or in a cupboard for 10 minutes.
9. Follow with the titration step as explained for the determination of iodine from iodate.
10. Carry out a blank determination of the reagents and make one or more control determinations using 100 mL of sodium chloride solution to which has been added appropriate quantity of potassium iodide control solution.

**CONVERSION CHART FOR IODINE IN FORTIFIED SALT (PARTS PER MILLION)**  
**Salt fortified with Iodate or Iodide**

Volume Thiosulphate (mL)	Iodine (ppm)	Volume Thiosulphate (mL)	Iodine (ppm)	Volume Thiosulphate (mL)	Iodine (ppm)	Volume Thiosulphate (mL)	Iodine (ppm)	Volume Thiosulphate (mL)	Iodine (ppm)	Volume Thiosulphate (mL)	Iodine (ppm)
0.1	1.1	2.0	21.2	3.9	41.3	5.8	61.5	7.7	81.6	9.6	101.8
0.2	2.1	2.1	22.2	4.0	42.4	5.9	62.5	7.8	82.7	9.7	102.8
0.3	3.2	2.2	23.3	4.1	43.5	6.0	63.6	7.9	83.4	9.8	103.9
0.4	4.2	2.3	24.4	4.2	44.5	6.1	64.7	8.0	84.8	9.9	104.9
0.5	5.3	2.4	25.4	4.3	45.6	6.2	65.7	8.1	85.9	10.0	106.0
0.6	6.4	2.5	26.5	4.4	46.4	6.3	66.8	8.2	86.9	10.1	107.1
0.7	7.4	2.6	27.6	4.5	47.7	6.4	67.8	8.3	88.0	10.2	108.1
0.8	8.5	2.7	28.6	4.6	48.8	6.5	68.9	8.4	89.0	10.3	109.2
0.9	9.4	2.8	29.7	4.7	49.8	6.6	70.0	8.5	90.1	10.4	110.2
1.0	10.6	2.9	30.7	4.8	50.9	6.7	71.0	8.6	91.2	10.5	111.3
1.1	11.7	3.0	31.8	4.9	51.9	6.8	72.1	8.7	92.2	10.6	112.4
1.2	12.2	3.1	32.9	5.0	53.0	6.9	73.1	8.8	93.3	10.7	113.4
1.3	13.8	3.2	33.9	5.1	54.1	7.0	74.2	8.9	94.3	10.8	114.5
1.4	14.8	3.3	35.0	5.2	55.1	7.1	75.3	9.0	95.4	10.9	115.5
1.5	15.9	3.4	36.0	5.3	56.2	7.2	76.3	9.1	96.5	11.0	116.6
1.6	17.0	3.5	37.1	5.4	57.2	7.3	77.4	9.2	97.5	11.1	117.7
1.7	18.0	3.6	38.2	5.5	58.3	7.4	78.4	9.3	98.6	11.2	118.7
1.8	19.1	3.7	39.2	5.6	59.4	7.5	79.5	9.4	99.7	11.3	119.8
1.9	20.1	3.8	40.3	5.7	60.4	7.6	80.6	9.5	100.7	11.4	120.8

**FORTIFIED SALT-TABLE A-1  
INSPECTION FORM FOR INCOMING IODINE COMPOUNDS**

<b>Product Type (Iodate or iodide)</b>	<b>Purchase order #:</b>
<b>Manufacturer:</b>	
<b>Inspected by:</b>	<b>Date:</b>
<b>SPECIFICATIONS</b>	<b>OBSERVATIONS</b>
Quantity:	
Integrity of boxes (tick appropriately) <input type="checkbox"/>	
Lot number <input type="checkbox"/>	
Production date <input type="checkbox"/>	
Expiration date <input type="checkbox"/>	
Content claimed in label <input type="checkbox"/>	
Certificate of Analysis <input type="checkbox"/> (results for every micronutrient)	
Other	
Accepted <input type="checkbox"/>	Rejected <input type="checkbox"/>
<b>REASONS FOR REJECTION/ACTIONS TAKEN</b>	
<b>Received by:</b>	<b>Date:</b>

**FORTIFIED SALT QC/QA - TABLE A-2  
IODINE COMPOUND INVENTORY CONTROL LOG**

Page No. \_\_\_\_\_

DATE	RECEIVED				DISPATCHED	IN STOCK (C) (C) = (A) – (B)	Receipt and QC-Review (Name and signature)
	Supplier COA #	#DRUMS (A)	LOT ID (DRUM Nos.)	EXPIRATION DATE	LOT ID (DRUM Nos.) (B = # DRUMS)		

<b>Fortificant sample sent to external lab.:</b>	Identification:	[Iodine] = (mg/kg)	Identification:	[Iodine] = (mg/kg)
--	-----------------	--------------------	-----------------	--------------------

**Date of reporting:** \_\_\_\_\_ **Name and signature:** \_\_\_\_\_



**FORTIFIED SALT QC/QA - TABLE B-1**  
**PRODUCTION LOG FOR IODINE PREMIX**

Salt factory: \_\_\_\_\_

Page No. \_\_\_\_\_

Year: \_\_\_\_\_

DATE	Weight <sup>3</sup> of filler (kg)	Weight of the iodine compound (kg)	Final weight of the premix (kg)	Premix Preparation (Time)		Final premix weight/ weight of iodine compound	QC-Review (Name and signature)
				Start	End		

\_\_\_\_\_ <sup>3</sup> For premixes in solution, it is the volume in liters.

**SALT FORTIFICATION: TABLE B-2**

**WEEKLY CHECK UP OF EQUIPMENT USED IN SALT FORTIFICATION WITH IODINE**

**Date:** \_\_\_\_\_

**Page No.** \_\_\_\_\_

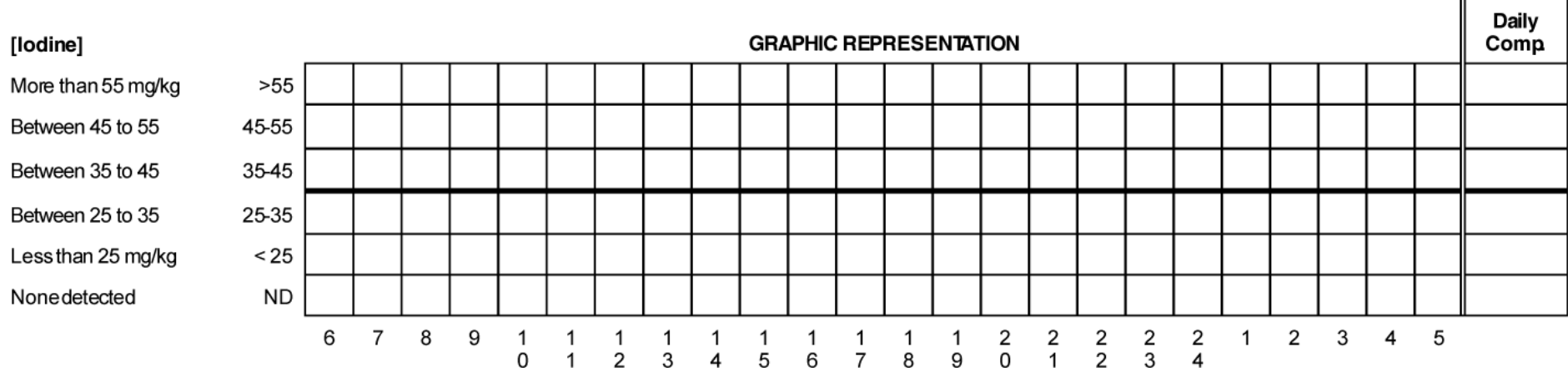
<b>EQUIPMENT/DEVICE</b>	<b>CONDITION<sup>4</sup> (√)/(X)</b>	<b>OBSERVATIONS</b>
1. Blender		
2. Balance		
3. Pump		
4. Drier		
5. Spraying/Drip Equipment		

**Name/Signature:** \_\_\_\_\_

\_\_\_\_\_  
<sup>4</sup> Condition: (√) = adequate, (X) = inadequate

## FORTIFIED SALT QC/QA - TABLE C-1 PRODUCTION AND QUALITY CONTROL LOG FOR FORTIFIED SALT<sup>5</sup> WITH IODINE

SHIFT (Time)	SALT PRODUCED M.T.	PREMIX USED (KG)	SALT FORTIFIED/ PREMIX USED	NOTES	COMMENTS:	DATE:
						Results from Quantitative Testing <sup>6</sup> :
						[Iodine] (mg/kg) =
<b>Daily Total</b>						
<b>Total To Date</b>						
					Responsible:	Signature:



Time of day (hour)

<sup>5</sup> This table is based on Log-form from the Los Tarros Refinery, S.A. in Guatemala

<sup>6</sup> These results may be obtained in the factory quality control laboratory or from an external laboratory.



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