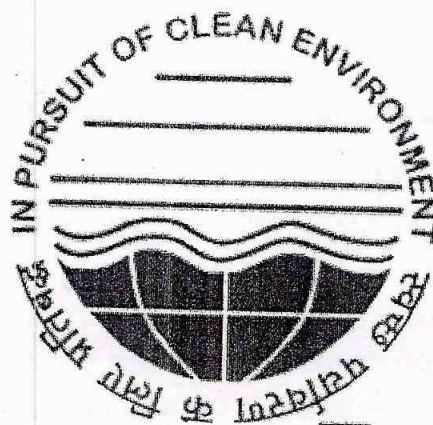


Guidelines for Gold Assaying and Hallmarking Centres



Central Pollution Control Board
(Ministry of Environment, Forest and Climate Change, Govt of India)
Parivesh Bhawan, East Arjun Nagar
Delhi-110032

(October 2020)

Environmental Guidelines for Gold Assaying and Hallmarking Centres

Background:

An Original application (OA) No. 568/2019, James Jose, Managing Director, CGR Hall markers Pvt. Ltd. vs Govt. of India was filed in the Hon'ble NGT highlighting the air pollution caused by acidic fumes in gold hallmarking centres from the process of Gold Assaying and Hallmarking without complying the pollution control norms. Hon'ble NGT vide its order dated 18.11.2019 directed CPCB to *"update the existing guidelines in the matter so that environmental norms are met in the process"*. There is no existing environmental guidelines prepared by CPCB for Gold Hallmarking Centres. These Hallmarking centres are BIS certified under the provision of Indian standard IS 15820:2009.

In compliance of Hon'ble NGT order, CPCB has framed Environmental Guidelines to bring such facilities into the environmental regulatory framework.

2.0 Hallmarking:

The BIS (Bureau of Indian Standards) Hallmark is a certifying mechanism to certify the purity of precious metals jewellery viz. gold and silver, sold in India. The testing and marking of the jewellery is done in BIS certified Assaying & Hallmarking centres across the country. BIS has framed & published the "Guideline (HM/A&HC/Guidelines/2, September, 2018)" for recognition and operation of hallmarking centres. BIS guidelines stipulate the procedures for grant, operation, renewal, suspension and cancellation of recognition of Assaying and Hallmarking (A & H) Centers. Indian standard IS 15820:2009 is the basis for recognition of assaying and hallmarking centers, which specifies a Fire Assay test for Assay and Hallmarking of gold, following the procedure prescribed in the method IS 1418: 2009 (Assaying of Gold in Gold Bullion, Gold alloys and Gold Jewelry/Artefacts: Cupellation- Fire Assay Method.)

There are 923 recognized Gold Assaying and Hallmarking facilities in India. Highest number of such facilities is in Southern region (312 Nos), followed by Western Region (203 Nos), Eastern Region (181) Central Region (133) and Northern Region (94).

3.0 Gold Assaying Process:

Hallmarking of jewellery/artefact is done in BIS certified facilities/centres, which acts as testing laboratories. These hallmarking facilities/centres/labs are located inside city areas or in busy commercial or business complexes nearby the jewellery manufacturing hub/markets.

Assaying is the technical term used for the quantitative chemical analysis of precious metals. In context of Gold Jewellery, assaying means determination of gold in the jewellery/article. The steps involved in **Gold Assaying process** are as follows:

- i. **Reception Section:** The process starts from reception. Jewelry are received from different parties i.e. jewelers and are sorted as per their purity claimed by the party and after acceptance, the jewellery are sent for Assaying.
- ii. **X-ray Fluorescence (XRF) Section:** After receiving the jewellery sample, the fineness (purity as declared by customer) of the samples are verified by the XRF machine by comparing with the reference material.
- iii. **Melting Section:** The accepted samples (Jwellery/artefacts) are cut/drilled in the defined quantity as per BIS guidelines and these drilled/cut piece of sample is then homogenised in melting furnace in graphite crucibles.
- iv. **Sample preparation:** The homogenized sample is weighed and other metals i.e. silver and copper is mixed with the homogenised sample and put in lead foil, which is then assayed. Out of several techniques available for assaying precious metals, Fire Assaying is one of the oldest and most reliable methods for the quantitative analysis of gold and silver.
- v. **Assaying section (Fire Assay Test):**

As per the standard IS 15820:2009, Assay and Hallmarking of gold is done by the fire assay test as per the method IS 1418: 2009 (Assaying of Gold in Gold Bullion, Gold alloys and Gold Jewelry/Artefacts). In this test, magnesia or calcium phosphate cupels, parting acids (Nitric acids of specific gravity 1.2 & 1.3 g/cm³), lead foil, precious metals (silver) and other metals like copper are used. The fire assay method is based on the principle of removal of all base metals like lead, copper, etc, present in the sample from noble metals like gold and silver through the process of cupellation and Parting.

Cupellation. In this process samples are kept in cupels for cupellation inside the muffle furnace for 25 min at 1100°C. During the process, lead is oxidised into lead oxide & emitted in the form of fumes, whereas other impurities along with lead is absorbed in cupels.

Parting: Once cupellation is completed, a gold and silver alloy in the form of bead is obtained. Separating silver from gold by selectively dissolving silver-gold alloy in Nitric acid, is known as parting.

4.0 Sources of Environmental pollution associated with Fire Assay Procedure and Environmental issues of Hallmarking Centres:

Main sources of pollution in Fire Assay Testing and other environmental issues associated with hallmarking centres are as under:

a) Air Pollution:

Lead oxides and Nitrous fumes are generated during cupellation and parting acid treatment respectively. These fumes, if inhaled may pose a health hazard to personals/workers involved in assaying, if not addressed properly.

To control the emissions, fume extraction system is installed and the fumes generated are sucked through suction hood and exhausted fumes are scrubbed by sprinkling of water. The scrubbed water is collected and the recirculate back in the process.

b) Water Pollution

As such there is no usage of water in the process, however the scrubbed water is generated from scrubbing operations during fume extractions. Though the scrubbed water is recycled and recirculated in the process, but over a period of time it is discharged which contain lead as contaminant.

c) Hazardous waste:

During the process of cupellation, Cupels become contaminated due to the absorption of lead and other heavy metals. Used/Spent cupels bearing lead

and scrubbed water containing residues of lead are the hazardous wastes generated during fire assay posing risk to the environment.

The spent acids generated during parting process are also hazardous waste generated in the fire assay test. The parting process involves boiling of a metal mixture (Gold & Silver) with parting acid (Conc. Nitric acid) to remove the silver. In this process silver present in the metal gets dissolved with nitric acid leaving only gold in its purest form. After recovering dissolved silver from acid, the spent parting acid (Conc nitric acid) is generated which is highly acidic and may adversely affect the receiving environment, if discharged without proper neutralization and treatment. The quantity of nitric acid used in the process is approximately 0.5 litres/assaying and on average daily spent acid generation is 1.0 lit/day. Spent acid has pH about 2.0. Spent acid generated is collected in the small container (20-25 litres) to recover silver.

5.0 Environmental Guidelines:

Environmental Guidelines for "Environmental Guidelines for Gold Assaying and Hallmarking Centres"

1. The emissions from cupellation and parting process should be channelized through a well-designed suction hood and duct arrangement system to control lead and nitric acid fumes.
2. The extracted fumes from cupellation and parting should be scrubbed by installing well designed scrubbing system for removing the pollutants from the exhausted air & discharged through appropriate stack as per SPCBs consent conditions.
3. The adequacy/efficiency of the Scrubber system installed need to be verified by the SPCBs or through Expert institutions.
4. The spent acid generated from parting acid should be sent to TSDF or neutralized before its disposal. These Hallmarking centres should have facilities of pH testing like litmus paper, pH meter to check that the spent acid is neutralized.

5. The Spent cupels/scrubbed water containing lead should be sent to TSDF or to the authorized registered lead recyclers dealers.
6. Manifest/records should be maintained for storage and disposal of spent acid/cupels/scrubbed water residue generated during the process.
7. Proper personal protection equipment's such as Face Shields, Helmets, Acid Gloves, First Aid Box, etc. must be used by the personals carrying out fire assay & parting test.
8. Good housekeeping should be maintained by frequent and regular cleaning of the assay lab, preventing lead dust from accumulating on laboratory surfaces.
9. All the gold assaying and hallmarking centers shall obtain necessary Consents under the provisions of Water (Prevention and Control of Pollution) Act, 1974 & Air (Prevention and Control of Pollution) Act, 1981 & Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016 from the concerned State Pollution Control Boards / Pollution Control Committees.
10. The Gold Hallmarking Assaying facilities/Centres should be established as per the siting policies/guidelines of local administration.
11. The Blood test of worker for lead, should be done once in a year who has worked for at least 6 months in such facility.
12. BIS may explore new alternate instrumental methods like Spark or Arc OES with low pollution foot print for assaying of Gold.
13. BIS may also make mandatory to have a copy of consents issued by SPCBs/PCCs under Water Act 1974 & Air Act 1981 and Authorization certificates while issuing the BIS certificates.

Item No. 03

Court No. 1

**BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI**

Original Application No.568/2019

(With Report dated 01.10.2019)

James Jose, Managing Director, CGR
Hallmarkers Pvt. Ltd.

Applicant(s)

Versus

Govt. of India

Respondent(s)

Date of hearing: 18.11.2019

CORAM:

**HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON
HON'BLE MR. JUSTICE S.P WANGDI, JUDICIAL MEMBER
HON'BLE MR. JUSTICE K. RAMAKRISHNAN, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER
HON'BLE MR. SAIBAL DASGUPTA, EXPERT MEMBER**

For Respondent(s):

Mr. Jogy Scaria, Advocate for KSPCB
Mr. Raj Kumar, Advocate for CPCB

ORDER

1. The issue for consideration is the need for regulatory regime to check acidic activities in testing of gold. A report was sought from the CPCB and the Kerala State PCB with reference to the allegation that Bureau of Indian Standards (BIS) released acids in the environment while testing gold with a view to check the standards.
2. The report furnished by the joint Committee comprising of the CPCB and the State PCB is that the Committee visited BIS certified gold assaying/hallmarking facility in Ernakulam along with two other facilities in Ernakulam on 23rd and 24th August, 2019. Following information was noted:

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- a. Almost all the assay and hallmarking centers are located inside city areas or in busy commercial or business complexes.
 - b. These units seldom comply with the pollution control norms or have adequate measures to contain toxic fumes or emissions emanating in the process of precious metal assaying by conventional fire assay method.
 - c. There is no emission monitoring systems in these hallmarking centers.
 - d. There are no personal protective equipments available or being used by the personals handling test procedures.
 - e. Regulatory procedures for the disposal of hazardous residues generated during assaying/testing are not followed in many of the facilities.
 - f. The approved gold hallmarking method is fire assay test, which requires destructive sampling and many of the manufacturer (customers of hallmarking centers) do not prefer sampling of the finished jewellery articles. Due to this spurious hallmarking practices are on rise without conducting standard fire assay test."

3. The Committee also considered the guidelines dated 02.09.2018 for recognition and operation of hallmarking centers. 851 hallmarking facilities are recognized in Maharashtra, West Bengal, Tamil Nadu and other States. The Committee conducted 'Fire Assay Test' and also considered 'hazardous waste generation' and 'Gold Assay Techniques'. In the hallmarking centers, it was observed that toxic emissions are released.

4. The Committee has made following observations and recommendations:

"7.0. OBSERVATIONS OF THE JOINT COMMITTEE

- i. The testing of the jewellery as well as the marking is done in approved, private assaying & hallmarking centers across the country. Approval and monitoring of such private undertaking are done by BIS. Although, hallmarking gold jewellery is mandatory, it is yet to be implemented. Due to wide acceptance of BIS

hallmarking among consumers, fake hallmarking of jewellery is on rise.

- ii. Most of the hallmarking centers are in the busy commercial areas.
- iii. Even though there are many techniques available for assaying precious metal with merits and demerits, the conventional fire assay is still the preferred assaying method for higher accuracy, repeatability, moderate and comparatively lesser cost of analysis.
- iv. The fire assay test does create toxic emissions by way of toxic metal and acidic fumes.
- v. The AAS or ICP methods, requires expensive equipments, sample processing by acid digestion and trace amount of sample is lost during analysis.
- vi. XRF is a non destructive analysis with moderate cost of analysis and requires flattened sample for accurate analysis.
- vii. Spark/ Arc OES is a potential method, almost non destructive in nature and only limitation is the high equipment cost.

8.0 SUGGESTIONS OF THE JOINT COMMITTEE

- A. All the gold assaying and hallmarking centers in the country shall obtain the Consent to Establish / Consent to Operate under Water (Prevention and Control of Pollution) Act, 1974 & Air (Prevention and Control of Pollution) Act, 1981 of the State Pollution Control Boards / Pollution Control Committees. These units shall also obtain authorization under Hazardous and Other Wastes (Management & Transboundary Movement) Rules, 2016. The above regulatory requirements shall be made mandatory to all gold assaying/ hallmarking facilities and the same may be incorporated in the BIS guideline for gold assaying and hallmarking. The committee suggested the KSPCB to issue notice to all defaulting units.
- B. The lead fumes generated during cupellation and the acidic nitrous fumes generated during the parting acid treatment are to be treated by a proper fumes extraction / treatment system. Technical guidelines shall be formulated for selection, installation and operation of proper exhaust arrangement for fire assay furnace, parting acid chamber and for the fire assay room for proper extraction and treatment of fumes before discharging into atmosphere.

- C. Spent cupels containing heavy metals, scrubber water residue containing lead and spent parting acid are the specific hazardous wastes generated during fire assay which need to be disposed properly through authorized waste disposal facilities as per the norms.
- D. The conventional fire assay method requires, sample to be scraped/ cut out of the sample and thus it is not an acceptable choice for the finished jewellery articles. Moreover, the use of hazardous materials like lead and parting acids during assaying, also make this method less preferable though it is a robust method for assaying. Due to the above constraints, alternate instrumental methods with low pollution foot print shall be explored.
- E. AAS and ICP methods require expensive equipments and elaborate sample processing in the form of acid digestion during analysis. As in many other countries XRF can be adopted for assaying and hallmarking, but the only limitation is the requirement of flat/ flattened sample.
- F. Spark or Arc OES is a potential method for precious metal assaying which is almost non-destructive method with minimum or no sample processing. This method is already used in many metal industries to test the purity of alloys and metals."
5. Learned counsel for the CPCB as well as the State PCB support the above suggestions. We see no reason why the same be not acted upon.
6. In view of the above, the CPCB needs to update the existing guidelines on the subject so that environmental norms are met in the process. The updated guidelines may be notified to all the State PCBs/PCCS within one month and compliance may be duly monitored thereafter. The compliance report may be furnished by all the State PCBs/PCCs to the CPCB. The CPCB may furnish consolidated report before the next date by email at judicial-ngt@gov.in. It is made clear that in case of non-compliance at any level, this Tribunal may have to take coercive measures including

imposition of environmental compensation on the concerned regulatory authority.

List for further consideration on 20.08.2020.

Adarsh Kumar Goel, CP

S.P Wangdi, JM

K. Ramakrishnan, JM

Dr. Nagin Nanda, EM

Saibal Dasgupta, EM

November 18, 2019
Original Application No.568/2019
AK



Item No. 70

Court No. 1

**BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI**

Original Application No. 568/2019

James Jose, Managing Director,
CGR Hallmarkers Pvt. Ltd.

Applicant(s)

Versus

Govt. of India

Respondent(s)

Date of hearing: 05.08.2019

CORAM:

HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON
HON'BLE MR. JUSTICE S.P. WANGDI, JUDICIAL MEMBER
HON'BLE MR. JUSTICE K. RAMAKRISHNAN, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

Application is registered based on a complaint received by post

ORDER

Allegation in this letter, which has been treated as an application, is against the air pollution caused by acidic activities of the Bureau of Indian Standard (BIS) in the process of gold testing and hall marking without compliance of the pollution control norms.

Let the Central Pollution Control Board (CPCB) and Kerala State Pollution Control Board (KSPCB) look into the matter and take appropriate action in accordance with law and furnish a factual and action taken report to this Tribunal within one month from the date of receipt of copy of this order by e-mail at judicial-ngt@gov.in. The KSPCB will be the nodal agency for coordination and compliance.

A copy of this order, along with complaint, be sent to the KSPCB and CPCB by e-mail for compliance.

Needless to say that order of National Green Tribunal is binding as a decree of Court and non-compliance is actionable by way of punitive action including prosecution, in terms of the National Green Tribunal Act, 2010.

List for further consideration on 18.11.2019.

Adarsh Kumar Goel, CP

S.P. Wangdi, JM

K. Ramakrishnan, JM

Dr. Nagin Nanda, EM

