Development/Implementation of Training Program for Jewelry Testing, Assaying and Hallmarking (CTI 25 / 99T)

-Terminal Report-

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CHAPTER 1

1.1 INTRODUCTION

The project “Development/Implementation of Training Program for Jewelry Testing, Assaying and Hallmarking” is in line with the priorities set by APEC Leaders and Ministers particularly on the detailed action program for the Ecotech Measure under the APEC Early Voluntary Sector Liberalization (EVSL) for gems and jewelry. The APEC EVSL aims to promote an environment conducive to increased liberalized trade and investment activities within the APEC region and is considered to generally benefit the member economies.

The project was conceived with the full intent of securing the participation of the APEC private sector and concerned institutions in the gem and jewelry industry to facilitate investment and trade in the region. It focuses on precious metal testing and hallmarking which is a non-tariff factor that was perceived to have a bearing on trade and investment in the gem and jewelry sector.

The jewelry trade is largely influenced by buyer-seller relationship. This holds true regardless of whether the transaction is on a direct buyer basis or wholesale basis. Unlike garments and other wearables, direct consumers do not feel the same confidence and ease when shopping for a piece of jewelry. The inconsistencies of standards clearly exacerbate the situation and countless sales have been aborted due to the absence of common definitions. For example, some traders may mark one piece of gold jewelry as "18 karat gold" (18k) while some others may mark it as fineness not less than 750. This creates confusion for traders as well as consumers.

Under karating is a serious problem around the world. An under karated jewelry is marked with a higher fineness than its actual precious metal content. Hence, a gold piece marked 18k or 750, for example, may contain only 17k or 70.83% gold instead of 75%. Needless to say, retailers who knowingly sell under karated gold jewelry create the impression that they are giving a bargain because their prices are so low, but if there is actually less gold, the customer is not getting any bargain. Unfortunately, most people never learn that they have bought under karated gold. Gold under karating has tarnished the industry's reputation in the minds of many consumers. In fact, in a survey conducted in the US in 1999, a large proportion of customers feel vulnerable and suspicious when buying jewelry. Less than half of survey respondents (47%) felt confident that the jewelry

they purchased contained the metals and gems the store said it did.

In the jewelry trade, the stakeholders could be categorized into producers, wholesale-buyers, wholesale-sellers, retailers and direct consumers. The need for trust is more crucial for the last two players. Being sure that gold is properly represented in terms of its value is what really matters. One should get what he/she pays for. In buying jewelry items, one should look for a manufacturer's registered trademark, a mark stamped near the karat mark. To avoid being held liable themselves, more and more retailers, wholesale-buyers and sellers are buying only from manufacturers willing to stamp what they make with their own mark. Buying jewelry with a manufacturer's trademark is an assurance that one gets what he/she pays for, since the product can be traced to a specific manufacturer whose name and reputation are on the line. A hallmark on the other hand, further increases this assurance by virtue of the legal imprimatur of the economy or the integrity of the industry association or the hallmarking office. This further levels the playing field for the producers. However, this could also serve as a non-tariff barrier if standards from one economy to another vary.

The project is very timely considering that the jewelry industry has become very competitive especially with the on set of e-commerce. The use of internet in business transactions has contributed to levelling the playing field arena in the jewelry trade which calls for an effective system to show content of precious metal in jewelry.

The project “Development/Implementation of Training Program for Jewelry Testing, Assaying and Hallmarking” provides a setting where jewelry manufacturers in the APEC regions would have common understanding and acceptance of hallmarking and assaying systems for the benefit of not only jewelry manufacturers and retailers but most importantly consumers.

1.2 PROJECT STEERING COMMITTEE:

The project steering committee is composed of the following:

- Ms. GIA MARIE C. ANDRES, Board of Investments, Department of Trade and Industry, Project Overseer
- Mr. VICENTE A. PITA, Bureau of Export Trade Promotion
- Ms. NILDA ADAO, Bureau of Product Standards

- Ms. CECILIA RAMOS, Chairman, Meycauayan Jewelry Industry Association

- Mr. GUISEPPE TROISI, Board of Directors, Guild of Philippine Jewellers, Inc.

The APEC Secretariat contracted the San Eligius Fine Jewellery Training Center to implement the project.

1.3 OBJECTIVES

The project aims to:

- Promote a harmonized and standardized system of jewelry testing, assaying and hallmarking among APEC member economies;

- Assist the private sector among APEC economies with no established hallmarking/assaying system to establish its own and at the same time to have access with technology and expertise in order to upgrade their technical capabilities, reach a common level of progress and reduce economic and technical disparities among APEC economies;

- Give APEC markets and consumers assurance and safeguards on the quality and reliability of jewelry products produced within the APEC region.

1.4 DEFINITION OF TERMS

Aqua Regia	- which in Latin means "royal water" because this combination of corrosive acids will dissolve gold and platinum by action of the liberated chlorine which no acid alone can do
Assaying	- the term describes a quantitative procedure in which a fusion is used to separate precious metals from a known amount of sample. (See also cupellation).
Atomic Absorption Spectroscopy	- are particularly useful for measuring low levels of elements in all metallurgical materials.
Cupellation	- a method of purifying and assaying precious metal. It is an oxidizing fusion of lead, gold and silver in a cupel (a small, shallow, porous cup usually made of bone ash or magnesite). Oxidized metals are absorbed into the cupel. The remaining metal such as gold and silver will then be weighed and calculated against the oxidized metal to determine its fineness.
Fineness	- means the number of parts by weight of fine gold, silver and platinum in 1,000 parts by weight of alloy. It may also be expressed in karats as was the old practice.
Hallmark	- is a quality control mark placed on an article made of precious metal. Sometimes it is called a hall, assay or standard mark. It is usually applied to gold, silver and platinum articles by an independent testing or assay office which guarantees that it conforms to the legal standard of precious metal content or fineness. The hallmark is applied to such objects as a means of safeguarding the purchaser against fraudulent practices.
Hallmarking	- is a scheme whereby precious metal articles

	are checked and certified for their precious metal content by a qualified and independent office before the articles are released for sale. Hallmarking is the world's first known consumer protection law.
ICP (Inductively Coupled Plasma)	- emission spectrometer with the capability of simultaneously measuring the platinum emission line. In the analysis of platinum group elements, the final element readings are normally done using the ICP.
Karat	- the term denotes a measure of purity; 24 karat is pure gold. Thus, 14 karat gold is by weight 14/24 fine gold and the balance (10/24) is alloy metal.
Precious Metals	- usually gold, silver, platinum and palladium are known as precious metals in the jewelry industry.
Solder	- is an intermediary non-ferrous alloy whose composition in a molten state becomes extremely fluid, and has affinity for the metals joined. The solder flows freely in the space between the parts to bond them, or in the joint space where it acts as permanent filler.
Titration	- is a process of determining the concentration of a substance in a solution (its strength) by testing its reaction with another known substance introduced in a specific amount to the solution.
Touchstone	- also called a test stone, it is used to test the quality of a given precious metal. Touchstone is used in conjunction with a test needle sets tipped with a piece of known quality platinum, gold or silver alloy, and acid stored in a bottle with a ground glass stopper and an attached glass rod that hangs into the acid. Experts compare standard and sample metals and detect sensation differences such as smoothness

	or roughness, greasiness or dryness as well as color.
X-ray Fluorescence Analysis	- a non destructive method which screens precious metal jewelry items (gold and platinum) to determine the metal content of the item that is tested.

1.5 ACRONYMS

APEC	- Asia Pacific Economic Cooperation
BAO	- Bangkok Assay Office
BSP	- Bangko Sentral ng Pilipinas
CGJA	- Chinese Gems and Jewelry Association
ClS	- Chartered Industries of Singapore
EVSL	- Early Voluntary Sector Liberalization
HKJITC	- Hong Kong Jewellery Industry Technology Centre
HKJMA	- Hong Kong Jewellery Manufacturers Association
HKPC	- Hong Kong Productivity Council
HRD	- Human Resources Development
ICP	- Inductively Coupled Plasma
ISO	- International Standard Organization
ISO 11426	- Determination of gold in gold jewelry alloys by cupellation or fire assay
ISO 11427	- Determination of silver in silver jewelry alloys by volumetric (potentiometric) method using potassium bromide
ISO 11494	- Determination of platinum in platinum jewelry alloys with ICP solution or spectrometric method using yttrium as internal standard element
ISO 4524/4	- Test methods for metallic coatings or electrodeposited gold and gold alloy coatings
JJA	- Japan Jewelry Association
KFPMC	- Korea Federation of Precious Metals Manufacturers Cooperation
KJA	- Korean Jewellers Association
KMA	- Korean Manufacturers Association
MDT	- Ministry of Domestic Trade
MDTA	- Ministry of Domestic Trade and Consumer Affairs
NGTC	- National Gem Testing Center
OEM	- Original Equipment Manufacturing
PMGTL	- Precious Metal and Gem Testing Laboratory
SAO	- Singapore Assay Office
SIRIM	- Standards and Industrial Research Institute of

	Malaysia
UK	- United Kingdom
XRF	- Xray Fluorescence Analysis

CHAPTER 2

2.1 JEWELRY TESTING AND HALLMARKING DESCRIBED

The term “testing” here denotes those that are used in determining metal fineness used for jewelry. It does not cover the tests applied in precious stones or methods used in appraising the value of jewelry.

The most common testing methods used in precious metals for jewelry are:

- Touchstone
- Cupellation
- Titration (for silver)
- X-Ray Fluorescence Analysis
- Atomic Absorption Spectroscopy
- Inductively Coupled Plasma or ICP - (for platinum)

The touchstone, also called a test stone, is an old process of testing the quality of a given precious metal. Traditionally, touchstone is a basanite which is a black, hard, fine-grained, siliceous, extrusive igneous rock. In some places, a black flint slate, black basalt or black ammonites are used. The touchstone is used in conjunction with a test needle or test needle sets. Each needle is tipped with a piece of a known-quality platinum, gold or silver alloy, and acid stored in a bottle with a ground glass stopper and an attached glass rod that hangs into the acid.

The article being tested is filed in an inconspicuous place in order to expose the true base metal (the object may only be plated). This exposed area is rubbed on the stone with about six forward and backward strokes to form a deposit visible in one place, seen as a one-inch-long streak. Next to this, the test needle, whose tip is of a chosen, known quality of the object being tested, is rubbed in the same way, but some space is allowed between this and the first streak. Experts can detect sensation differences such as smoothness or roughness, greasiness or dryness, between the standard and the sample during rubbing. They can also judge similarities or differences in the composition by the comparison of the colors of the streaks. The most common acids which can be used to test metal sample streaks on a touchstone are hydrochloric acid, nitric acid, often mixed in varying amount to form a solution.

Acids are also used in testing the quality of the metal of a jewelry by a

visual estimate judging of its chemical reaction to acids. Preparation for such test is done by filing or scraping away a small area on the object or make a groove in it. A solution will then be prepared out of hydrochloric acid, distilled water, stannous chloride with small amount of tin. The solution is then dropped to the grooved area of the object and allow the metal in the contaminated area to react by changing its color.

On the other hand, the process of cupellation is the result of the earliest production of lead and silver, often found together in native ores from which they had to be separated. Most economies with existing assaying offices/facilities use cupellation method. It is used to determine if items contain the required degree of purity to make it eligible for legal/official hallmark stamping, or to ascertain if the quality of an imported article is suitable for stamping.

The process start by weighing the object to be tested and then a sample of the metal would be taken from the object. The scraping or fragment would be weighed and recorded. This will then be wrapped in a pure lead foil whose quantity has to be in proportion to the sample to be tested. All these are placed in a cupel, a small and shallow cup made of bone ash or lime phosphate or other material such as burned cores of ox horns. The ash is combined with sufficient water to form a paste which is forced into a circular mold made of cast steel where it is allowed to solidify and partially dry. The cupel is freed by striking the mold, and then dries completely in air. The result is a highly refractory and porous cupel, thus the term cupellation.

The cupel with its metal contents is placed in a muffle furnace which is then heated to 1000 degrees Centigrade (1832 degrees Fahrenheit). In this heat it is subjected to an air blast that causes the lead to rapidly oxidize to a litharge (lead oxide), melt, and flow around the bottom of the cupel and become absorbed into it. If the amount of lead is correct, its oxide forms a glassy coat on the cupel bottom that allows these other base metals to pass through, but resists penetration of the gold, silver or other precious metals. Because precious metals in pure form have lower affinity for oxygen than base metals, they resist oxidation and remain on the cupel surface. None of the gold is lost by evaporation under the right temperature, and very little of the silver.

When molten, the liquefied remaining precious metal takes on a hemispherical button shape which upon cooling and solidifying, retains a shining surface, and is easily separated from the cupel, exposing a rough bottom. The precious metal button is then weighed, flattened,

rolled thin, and placed in a solution of boiling nitric acid which dissolves its silver content, and leaves only the pure gold behind as a black powder which is collected by filtration, and weighed. The result is compared with the weight of the original sample taken from the object which enables the calculation of an accurate ratio of the amount of gold to the alloying metal it originally contained. If the result indicates conformity with the standard, the jewelry can then be stamped with appropriate hallmark.

In the case of silver, titration process is used. This method determines the concentration of a substance in a solution (its strength) by testing its reaction with another, known substance introduced in a specific amount to the solution. In the case of silver, the sample taken from the article is dissolved in nitric acid and as indicator, iron nitrate is added. A specific, controlled volume of ammonium thiocynate is titrated with this sample and forms an end point result: a silver salt (silver thiocynate) that sinks to the bottom of the container. Because a known quantity of ammonium thiocynate will combine with a specific quantity of silver, the results can be compared with a standard sample which will indicate the presence of the amount of silver for the amount of ammonium thiocynate added. The exact silver percentage can then be calculated.

In addition to the traditional assaying methods, the latest computerized sample management programs are used for computerized entry of samples for tracking and traceability of the samples throughout the assaying process. The Atomic Absorption are particularly useful for measuring low levels of elements in all metallurgical materials. This is for lower grade samples with very small and difficult to handle gold particles. The gold is dissolved in hydrochloric acid and the gold concentration is measured using Atomic Absorption.

X-ray Fluorescence works simply by a sample being irradiated with an unfiltered beam of x-rays which in turn causes an element to emit a characteristic fluorescence sets of lines. A sample is placed in an aluminum chamber which will house the sample during the mechanical analysis. The sample is then irradiated with an unfiltered beam of primary x-rays. To ensure a uniform exposure, the sample may be rotated during the time of irradiation. The purpose of the primary x-ray beams is to cause the elements present to emit characteristic fluorescence lines. A portion of the fluorescence lines are then collimated and directed onto the surface of the analyzing crystal. The line radiations are reflected and pass through an auxilliary collimator to the detector where the energy of the x-ray quanta is converted into electrical impulses or counts.

For testing platinum alloy jewelry, the Inductively Coupled Plasma (ICP) method is used. This method involves an accurately weighed sample which is dissolved in a solution (*aqua regia*) and made up to an exactly weighed mass. An exactly weighed portion of this sample solution is mixed with a buffer and an internal standard and made up to the standard measuring volume. Using an ICP-emission spectrometer, the platinum content is measured by comparison of the ratio intensities of the spectral emission of platinum with the ratios for solutions containing known masses of platinum and yttrium.

After determining the amount of precious metal contained in a given piece of jewelry, it should then be marked. In the case of gold where “karat” is popularly used, 24k would mean that 24 parts (out of a total of 24) are gold. In others, 24k would be 100 percent gold - or, pure gold. In 18 karat gold jewelry, 18 parts are of pure gold and six parts of another metal (or 18/24 = 3/4 = 75 percent pure gold); in 12 karat, 12 parts are pure gold, 12 parts another metal (12/24 = 1/2 = 50 percent pure gold) and so on. In some economies, 24 karat gold jewelry is required for certain jewelry pieces, but it is generally agreed that 24 karat, or pure gold, is too soft for jewelry use. In some parts of the world, 18 karat or 20 karat is preferred because of its brighter yellow color and because it is considered "purer" and more precious. In other economies, the percentage of pure gold is indicated by a number representing how many parts - out of a total of 1,000 parts - are pure gold. One thousand parts would be equivalent to 24 karat; seven hundred fifty means that 750 parts out of 1000 are pure gold. Thus, 750/1000 is equivalent to 3/4 or 75 percent pure gold. This ratio corresponds to 18k.

Many economies have established common standards that must be met for items to be legally called "gold". The laws governing the actual content of gold required in a piece of jewelry, however, vary. In the United States, to be called "gold", the items must be at least 10K; in England and Canada, 9k; in Italy and France, 18k.

Hallmarks in a given piece of jewelry also shows the maker’s identification which can be a name, initials, logo or insignia, the logo of an assay office, the place and date of manufacture.

The earliest hallmarking system still in effect today is that of the British. As early as 1327, hallmarking in United Kingdom (UK) became compulsory. The London Assay Office being operated by the Goldsmith’s Company may be the oldest assay company. In 1363, the sponsor’s mark became compulsory thus making testing and marking too time consuming. In 1478, a salaried assay master was appointed

and manufacturers had to bring their articles to the Goldsmith's Hall. This practice gave rise to the term "hallmarked".

The fineness mark for precious metals was introduced in 1544. The 1973 Hallmarking Act in UK unified the marking systems of the economy's assaying offices. The last amendment was made in January 1999 which increased the range of fineness and its corresponding marks in parts per thousand. Hallmarking is the world's first known instance of consumer protection law.

The latest international conference concerning the control and marking of articles made of precious metals occur in Vienna in 1972. The contracting economies agreed to the appointment of assay offices in their own economy which would control and maintain the standards of quality and marking formulated at the conference. The signatory economies agreed to accept each other's quality control stamps. Among other regulations, the convention defines technical requirements and standards of fineness for precious metals. It regulates the use of base metal parts, nonmetallic substances, the use of more than one precious metal in one object, and suggests a design for Common Control Marks for precious metals to be used internationally.

Some examples of hallmarks are shown in Appendix B.

2.2 METHODOLOGY AND PROCESS

The project requires the gathering of data from jewelry industries in APEC economies, applying the following basic methods:

- Survey
- Structured Interview and Key Informant Survey
- Focused Group Discussions
- On-site manufacturing plant observations.

Specifically, these surveys covered fine jewelry manufacturers, retailers, assaying offices, and relevant government agencies. Data gathering was undertaken using previously prepared questionnaires and interview guides. The surveys and interviews were aimed to ascertain the following:

- Existing testing/assaying and hallmarking practice in the industry
- Training needs of the industry on testing/assaying and hallmarking

- Views of industry leaders on testing/assaying and hallmarking *vis a vis* trade facilitation.

Questionnaires were disseminated through the offices of Philippine Trade Representatives based in APEC member economies. The Philippine Trade Representatives, in return, tapped the industry associations in their respective areas of mission to ensure that the questionnaires will reach the intended respondents.

The Key Informant Survey and Focused Group Discussion were applied to largely address institutional aspects such as roles and mandates, policies, coordination, etc. The identification of respondents to the Key Informant Survey was also made through the assistance of the offices of Philippine Trade Representatives. Participants in the Key Informant Surveys and Focused Group Discussions were officers and members of industry associations in proponent member economies. The list of respondents in the Key Informant Survey and Focused Group Discussions is attached in Appendix C.

For the training and workshop component, the design was re-structured to suit the needs of the economies surveyed (Please see Chapter 4 for the details in the workshop design).

2.3 LIMITATIONS

The project experienced various problems that led to some information gaps. The return of questionnaires distributed in all APEC member economies was poor that the data gathered were too negligible to consider. To address this limitation, the project team resorted to embassies of APEC member governments in the Philippines but still, the turn out was low. The project relied heavily on the Key Informant Survey, Focused Group Discussion and during the Workshop in gathering data and information required for the study.

While the project tried to maximize the generation of information through various methods and sources, the quality and quantity of information gathered were subject to limiting factors such as the general hesitancy of most respondents to give information for confidentiality purposes and the lack of interest by some, claiming that the jewelry business is highly based on strong relationship between buyer and seller and that factors such as assaying and hallmarking are not considered as key ingredients in conducting the jewelry trade.

CHAPTER 3

3.1 FINDINGS

Information on specific testing and hallmarking practices were gathered through interviews or key informant survey and focused discussion groups. Other information were obtained through relevant literature.

3.2 LOCAL INDUSTRY BRIEFS

3.2.1 United States of America

The jewelry industry in the USA consists of one-man manufacturing enterprises to bigger companies employing hundreds of workers. Company profiles are therefore varied and manufacturing processes are likewise diverse. Subcontract production is also prevalent. Many well-known brands and wholesale buyers maintain strong presence in the economy. The region of East Coast, Rhode Island apparently has the most dense concentration of jewelry manufacturing and other related industries while New York City is home to jewelry commerce and gold refiners as well as numerous “branded” or designer shops.

Despite the number of manufacturers, the USA remains one of the biggest markets of most APEC economies and the rest of the world.

Testing and Hallmarking Practices in the USA

Based on the interviews and available literature, assaying of imported gold articles is not compulsory. Trademarks and fineness marks are compulsory. Fine jewelry in the US has a minimum fineness of 10 karats or 0.416. Negative tolerance is limited to -0.003 for items without solders and -0.007 for articles containing solder. The industry polices its own ranks with the Jewelry Vigilance Committee serving as the ethics body.

The handbook “International Standards on Gold Fineness and Assaying Methods” published by the Hong Kong Productivity Council’s Hong Kong Jewellery Industry Technology Centre and the Hong Kong Jewellery Manufacturers Association listed five assay and marking facilities in the USA. In a traditional sense, these are not really hallmarking offices as compared to facilities in the United Kingdom since they assay primarily in line with gold refining/retrieval activities. As pointed out by the interviewees, the government does not operate assaying and hallmarking facilities nor systems. Consumer awareness,

however, is very high. Hence, manufacturing firms maintain strict standards with many of them having their own assays counterchecked by independent assayers. Consumer laws likewise provide more than ample protection to buyers.

3.2.2 JAPAN

The Japanese jewelry industry consists of craftsmen in small-scale to large-scale factories with workers reaching up to 400. Some companies have established presence in other economies like Thailand and China. The industry is represented by the Japan Jewellers Association (JJA). It has about 200 members.

The industry and the jewelry wholesalers import very significant quantities of raw materials and finished jewelry. The Jewelry Data Bank, in one of its studies showed that in 1988, some 2,479 carats of loose diamonds, 85 tons of gold, 62.7 tons of platinum were imported. In addition, finished jewelry imports accounted to 15.7 tons for gold and 2.3 for platinum. Retail sales of jewelry is placed by the agency at 1,474 billion yen. These figures clearly show that the Japanese jewelry industry is significant in the APEC trade.

Testing and Hallmarking Practices in Japan

Traditionally, assaying and hallmarking were done by Japan Mint Bureau. With its limited facilities and location constraints, turnaround time and assaying cost appeared to be a problem. This prompted the Japan Jewelry Association to develop its own hallmarking system. This included visitorial powers for random compliance and related Human Resources Development (HRD) interventions. The marks indicate the JJA logo, the manufacturer's mark and the metal fineness mark with purity expressed up to the 3rd digit. Thus, one can see 750 for 18k, Pt 950 for platinum, etc.

Hallmarking is on a voluntary basis but the industry leaders agree that as retail buyers become more aware, they will look for at least the fineness mark especially with higher-priced jewelry. This provides the market with legal avenues under consumer rights. For wholesale and export, the significance of hallmark decreases since it becomes a buyer and manufacturer arrangement with the buyer/wholesaler particularly those under Original Equipment Manufacturing (OEM) arrangements often times want their own logos placed on the item. In the case of economies with hallmarking laws, they placed their respective hallmarks.

The Japanese fine jewelry industry use the cupellation method or fire assay using ISO 11426.

3.2.3 SOUTH KOREA

The jewelry industry in South Korea varies in size with human resources ranging from 20 to 300. The major raw materials used are gold and silver with precious and semi-precious stones. Koreans import their precious metals and stones because these materials are not locally available. When buying gold, companies usually go through a bidding process. Currently, the raw materials are levied with 13% import duty. Illicit smuggling occurs in Korea especially by small-scale manufacturers because they find it too costly to pay the import duty tax. Precious metal made of gold whether mounted with or without stones are top products of the industry. Silver jewelry shares a small portion of the business because silver is commonly used for silver wares/flatwares like spoons, forks, and the like.

The jewelry industry is characterized by the use of modern technology and the thrust for export markets. Before the Asian crisis, Korean manufacturers basically caters to the domestic market but due to the will of the industry to overcome the economic crisis, they tried exporting their products to other countries. Some of them are now focused on the overseas market than the shrunken domestic market. One association said that if not for exporting, many of their members have probably closed shop.

Testing and Hallmarking Practices in South Korea

Assaying and hallmarking of precious metals has long been a practice by the jewelry industry in Korea as claimed by the industry leaders. In fact, the two jewelry associations visited, the Korean Jewellers Association (KJA) and the Korean Manufacturers Association (KMA) maintain their own assaying and hallmarking facilities for their respective members. While the government does not maintain its own assaying and hallmarking facility, it recognizes and supports the Precious Metal and Gem Trade Laboratory (PMGTL), an assaying laboratory which is privately-run. Meanwhile, the Korea Federation of Precious Metals Manufacturers Cooperation (KFPMC) do not have assay facilities but uses the facilities of the KMA.

There are about three methods used in testing precious metals in Korea. These are the x-ray fluorescence analysis (XRF), cupellation by fire assay, and touchstone. The KJA uses the touchstone; the PMGTL uses the XRF; and the KMA uses the three methods. The KMA uses

the touchstone and XRF for the domestic market. Jewelry items for export are assayed using cupellation by fire assay because the method is the most accurate way of determining the precise proportion of gold, silver, platinum, etc. in a given alloy.

In Korea, there is a voluntary hallmarking system which is implemented by the industry associations. The KJA which is composed mostly of jewelry retailers said that the jewelry articles manufactured by their jewelry suppliers are checked and tested by their assay offices to ensure that the articles conform to the prescribed fineness. If it passed the standard, then they require the jewelry manufacturers to carry the mark/logo of the association which will guarantee the quality of the article. They say that buying articles bearing their marks can assure one the value of their purchase.

The KFPMC does not have common logos/marks but members have their own respective mark/logo. The purpose is to identify the firm responsible for the quality of a finished product. The PMGTL and the KMA have their own marks/logos. Jewelry manufacturers bring their articles for testing to the laboratories of PMGTL and KMA. Once the articles are found to pass the standard, these are stamped with corresponding PMGTL or KMA logo. If the articles failed the test, these will be returned to the owner without any stamped logo/mark.

All marks are registered with the Patent Office. These marks are also displayed in jewelry shops so the buying public would become familiar with the marks. A complete hallmark consists of the association mark, followed by the fineness number. Officers of KMA and KFPMC said that they voluntarily police their own ranks and impose their own sanctions. Sanctions range from paying of fines and the forfeiture of the right to sell for three months.

In relation to the harmonized hallmarking system among APEC economies, the Korean fine jewelry industry welcome it. They said that this will grant equal, mutual recognition and acceptance to hallmarked goods among industry players across APEC economies. They also underscored its importance to consumers.

3.2.4 PEOPLE'S REPUBLIC OF CHINA

The jewelry industry in China can be roughly categorized into companies primarily engaged in jade and those that primarily use precious stones and metals such as diamonds, gold and platinum. A big number of the latter are foreign owned or have foreign partners. A significant number are located in Guangzhou. Several Hong Kong-

based jewelry firms have established operations in China. The industry is represented by the Chinese Gems and Jewelry Association (CGJA) which claims to have more than 40,000 members. These include practically all the big name enterprises such as Jindeli group, Shanton Chaonhangi Corporation, Beijing Jinfagzzi Diamond Co. Ltd. and Beijing Fanghuan Jewels Corporation.

Some 40 years ago, large-scale mining of diamonds started in some regions of China such as Huanan, Liaoning, Guizhou and Xingiang. While primarily industrial grade (except for Liaoning) these finds could have potentials for highly competitive mass-produced jewelry. The industry is beset by raw material supply problems for both gold and stones with a perceived supply-demand gap of about 50 tons per annum despite the 175 tons local annual gold yields. The industry attributes these supply problems to stringent state import laws and high tariffs which could reach an aggregate of 40%.

Testing and Hallmarking Practices in People's Republic of China

The National Gem Testing Center (NGTC), a state run agency was established in 1991 to set standards. In addition, it provides mandatory testing, arbitration testing, training opportunities and information dissemination. There are some 70 state accredited testing facilities nationwide. These facilities, however, merely provide certificate for the items tested. They do not hallmark. Producers are supposed to send their products to these assaying offices. A notable service of the NGTC is the Training, Testing and Certification for Gemologists and Jewelry Sellers. Regulations on metal purities is relatively new in China and is primarily governed by the Jewellery-Fineners of Precious Metal Alloys and Designations (GB-11887-89) which took effect in December 1989. Apparently, consumer protection and increased buyer confidence is their primary reason for the adoption of marking systems.

In theory, the assay procedure is based on ISO 4524/4 which is a fire assay (cupellation) standard. A tour of the NGTC however did not indicate its practice. This was confirmed by the manufacturers visited. Some of the assay offices mentioned by the Hong Kong Jewelry Technology Center are the following:

- Guangzhou Gold and Jewellery Articles Inspection Center
- Shanghai Bureau of Technical Supervision
- Beijing Precious Metal Inspection Center
- National Jewellery Quality Supervision Inspection

A quick tour of the jewelry retail shops showed that the jewelry items

contained fineness marks with the certification available upon request. Like Japan, the industry leaders in China believed that the different economies should have harmonized standards and that these could start with understanding the practices of each economy.

3.2.5 HONG KONG, CHINA

The Hong Kong jewelry manufacturing industry is one of the largest exporters of fine jewelry in the world. It is also a major importer of jewelry. It is therefore natural that it has a very developed practice and standard for its precious metals.

The industry is primarily represented by several organizations foremost of which are the Hong Kong Jewelry Manufacturers Association (HKJMA), Hongkong Jade and Stone Manufacturers Association, Hongkong Jewellery and Jade Manufacturers Association. While most of the bigger manufacturers have established operations in mainland China, the vibrancy and growth of the jewelry industry in Hong Kong goes on. One of the bodies assisting the industry is the Hong Kong Jewellery Industry Technology Center. A joint undertaking by the Hong Kong Productivity Council (HKPC) and the HKJMA, it was established in 1995. It is now jointly managed by the government and the private sector.

Testing and Hallmarking Practices in Hong Kong

Gold and platinum jewelry on sale in Hong Kong must carry a mark of purity or fineness. This practice is enforced by the Customs and Excise Department of the Hong Kong government. While the above is the sole enforcer, other agencies such as the government laboratory provide testing services especially in matters of dispute. Today, jewelry shops include in their invoices/receipts the fineness and weight of their gold or platinum wares. Traders and suppliers even exhibit posters advising buyers to get proper documentation of their purchases.

Marking of gold is governed by Trade Description Order 1984 and covers alloys from 8 karats to 24 karats. The Order stipulates the following:

- Standard of Fineness
- Size of Fineness Mark
- Standards for Articles of Different Fineness
- Size of Marks for Surface Treated Articles
- Need for Invoice

- Need to Display Notice
- Exemptions
- Sanctions/Penalties

The marking for platinum is likewise defined by Trade Description Order 1988 and Trade Description Regulation 1988. Observation of jewelry shops was also done to augment available literature and interviews. One can readily see that the retailers bank on the "accuracy" of their marking as a selling tool. The "chuk kam" is really pure and the government and association make sure of this purity as well as other gold products eight (8) karats and above. To some shop owners, this practice buoys consumer confidence.

The Hong Kong Jewellery Industry believes that in the absence of a harmonized system of assaying and hallmarking, the least that should be done is for the APEC members to be able to understand each other's practices in terms of assaying and hallmarking.

The Hong Kong Jewellery Industry Technology Center (HKJITC)

One of the facilities visited was the HKJITC. Its facilities occupy the 5th floor of the HKPC which also offers the same services to other industry sectors. The center offers an integrated technical, testing, management, consultancy and information services to the jewelry industry. The rapport between this government body and its private sector counterpart is readily apparent.

The HKJITC head easily arranged interviews and visits to leading manufacturers and other industry leaders. The center has assaying facilitities for cupellation and ICP. From observation, it is manned by some of the best people and could serve as a model for developing APEC economies, not only in terms of the assistance it provides for the growth of the industry but more importantly by the strong synergy exhibited by the government and private sector.

3.2.6 CHINESE TAIPEI

The Chinese Taipei Jewelry Industry Association has around 115 members. Most of them are small to medium scale and about half of them are located in Taipei county. A few companies have large-scale production and/or process by commission.

Chinese Taipei jewelry industry has a large range of products which are generally classified into three, i.e. natural jewelry (from natural mineral, plant and animal), synthetic jewelry and karat gold which

includes plating gold articles.

There are only a few companies in Chinese, Taipei which manufacture fine jewelry. The biggest share in the business goes to stone processing and trading. Manufactured jewelry are dominated by imitation or fancy jewelry.

Testing and Hallmarking Practices in Chinese Taipei

The term “assaying” in Chinese Taipei denotes gem appraisal. Existing testing offices which number around 10 mostly offer gem stone analysis and issue certifications for gem stone authentication. These offices also offer training courses on gem stone analysis and appraisal.

At the moment, the fine jewelry industry in Chinese Taipei does not have assaying offices to certify fineness of precious metals. The need for certification from an outside body is more suitable to gem stones than precious metals as “they happen to constitute the highest cost in production”, said an officer of the Chinese Taipei Jewelry Industry Association.

Hallmarking in Chinese Taipei was an initiative of manufacturers. Some jewelry companies have their own facility to determine the purity and fineness of precious metals. Most companies buy their raw materials from reputable sources such as the government-run entity that regulates the buying and selling of gold. For companies that use second-hand jewelry, they have their own refining facilities.

The identification of metal purity of fineness, as stated in jewelry hallmarks made in Chinese Taipei lands in the hands of chemical and metal practitioners who are employed by the companies themselves. These employees bear professional titles or certifications (e.g. Chemical Engineer).

The certificate, which accompanies every piece of fine jewelry and the hallmarks stamped on it, contains the signature of a registered metal chemical professional. This person is responsible for the truthfulness/authenticity as claimed in the certification or hallmark. Any violation may result in forfeiture of his/her professional registration.

The Chinese Taipei Jewelry Industry Association would like to provide certification services. However, they are hesitant because it would be very difficult to control the quality of imported jewelry.

When buying jewelry, consumers rely on the reputation of the jewelry

companies and retail shops. They do not usually go out to have their newly purchased jewelry tested. Instead of consumers, a jewelry company may go to the extent of having its competitor's products tested to prove that their products are of low quality or substandard.

In cases when there is a consumer complaint, there are three options available. A consumer can go to 1) a government agency that is responsible for consumer protection, 2) private association that looks after consumer protection; and 3) a court or through the judicial system. The option of media expose is also open.

Respondents to the interview also expressed hesitation from standardized assaying and hallmarking system. They said that the existing one is more suitable as it is based on trust and confidence between the buyer and the seller. One jewelry manufacturer and retailer believed that having a strong reputation and brand name is a plus factor in this business. He said that ensuring product quality relies solely on the manufacturer and not on some law or regulation. He added that it is a process, a human activity. A company must take care of its products to ensure that the business thrives and survives.

An officer of the jewelry industry association in Chinese Taipei opined that standardized assaying and hallmarking system must be a joint undertaking between private and government since the industry has the experience while the government has the authority.

3.2.7 THAILAND

Gems and jewelry from Thailand are now regarded as world class both in terms of design and quality. The industry plays a very large part in the economy being the 6th largest export earner in 1997 totaling US$1.8 billion.

The jewelry industry in Thailand is composed mostly of small, medium and large sized companies employing a large number of skilled workers. The industry has more than 300,000 kilos or 35 million pieces combined capacity.

Thai jewelry companies are increasingly automating their jewelry production and gemstone cutting processes. They have moved on from a time when hand-work dominated most aspects of jewelry making to new manufacturing technologies such as casting, stamping, electroforming and cold soldering with lasers. Thai jewelry companies have invested heavily not just in new equipment and processes but also in research and development, as well as massive marketing and

promotion including the use of information technology.

The government of Thailand recognizes the industry's substantial contribution to the economy. It strongly supports the industry in terms of incentives, investment and export promotion and development institutes. In 1990, Gemopolis is founded and was designated as Thailand's diamond, gems and jewelry center by the Board of Investment and special industrial estate status by the Industrial Estate Authority of Thailand. The Bangkok Assay Office (BAO) which was established in 1985 is also located in Gemopolis and its primary objective is to provide testing/assaying services to the jewelry industry. The BAO's mission is to provide internationally accepted standard and quality precious metals to the industry. JJ Degussa, Thailand's first international metal refinery, is also situated in the Gemopolis. Its plant has a precious metal laboratory to perform complete range of analytical services to the jewelry industry. JJ Degussa aims to contribute to Thailand's emerging role as an important trading and export center for gems and jewelry.

Testing and Hallmarking Practices in Thailand

There is no official hallmarking system in Thailand. Manufacturers are required by the Consumer Protection Board to state the weight, purity (in karat) and trademarks in the jewelry. Stamping is done at company-level. Negative tolerance is not accepted in Thailand. Some of the methods used in gold analysis in jewelry companies are: touchstone, cupellation, x-ray analysis and atomic absorption spectroscopy.

Exporting is the most basic factor to consider in deciding if a batch of jewelry will be sent to an assay office. Most exporting companies usually have their products tested/assayed if these products will be shipped overseas to ensure quality.

For manufacturers who produce for the domestic market, they rely on reputable gold sources such as JJ Degussa and Bangkok Assay Office. Because of this, they do not find the need to have their finished products assayed for metal fineness.

The hallmarking services given by the BAO provides the consumer with some protection and confidence on the products they purchased. The BAO has been accepted throughout the Thai jewelry industry as a reliable testing center which is at par with any international assaying office.

There were mixed views received regarding harmonized hallmarking

system. At one end, an officer of the Thailand Gems and Jewelry Association believe that assaying and hallmarking is subsumed in the interaction and negotiation process between jewelry buyer and seller. He believes that trust and confidence which stem from long business relationship is more important than imposing a legal system to cover hallmarking of jewelry. On the other hand, a representative from one of Thailand's big fine jewelry manufacturer believes that there should be a legislated testing and hallmarking system as this will impel all companies, especially the small ones, to comply to quality standards.

3.2.8 MALAYSIA

Malaysia produces substantial amount of fine jewelry for exports. Between 1993 to 1997, the industry has 44.22% average annual growth rate in export performance. In 1997, the Malaysian fine jewelry industry posted US$489,580,000 value of exports.

Malaysia has an existing law on Trade Description (Articles Made of Precious Metals) Regulations of 1994 which is enforced by the Ministry of Domestic Trade and Consumer Affairs (MDTCA). Customer complaints are filed in the MDTCA. The law is strict. Fines up to RM 25,000 to RM 100,000 and five years in jail are imposed.

Standards and Industrial Research Institute of Malaysia (SIRIM) provides testing services to the jewelry industry. It is a non-profit organization that receives financial assistance from the government, funds from membership subscriptions and proceeds from sales of standards and other publications, testing fees and license fees for the use of SIRIM Certification Mark and other activities associated with standardization, industrial research and consultancy services. Under the MDTCA law on consumer protection, SIRIM also run tests to settle customer-seller disputes.

The jewelry industry federation in Malaysia also organized an assaying office to serve the testing needs of its members. Hallmarking is voluntary and was an initiative of the association, run and operated by the industry members. According to the officers of industry association, the "AU" hallmark which distinguish Malaysian-made jewelry from others already enjoyed a good reputation from other economies such as Singapore, Hong Kong and the Middle East. However, they added that this reputation is earned through long years of mutual confidence and trust between producers and buyers.

Recently, the government issued a regulation requiring each item to be stamped. A manufacturer observed that in Malaysia the system is good

considering there is a balance between government regulation and industry responsibility. The industry maintains the quality of products while the government serves as the watchdog.

3.2.9 SINGAPORE

Singapore's jewelry trade is generally classified into two: gold and platinum. Gold articles are further classified as traditional goldsmiths using yellow gold of 22k and 24k fineness, new generation outlets producing articles of white gold and high-end jewelry outlets which produce exclusive designs mounted with high-end gems/diamonds. Platinum articles are usually custom-made. Silver jewelry articles are generally not considered as valuable.

The gold jewelry demand in Singapore between 1995 to 1999 has its peak in 1997 at 22.4 metric tons. Exports amount to US$258,563,000 in 1997.

Testing and Hallmarking Practices in Singapore

The assaying facilities in the Chartered Industries of Singapore (CIS) were set initially to support the requirement of the Singapore Mint in the manufacturing of precious metal articles. The quality consciousness of the CIS Management resulted in its acquiring recognition as an acceptable assayer by the London Gold Market - a status accorded only to establishments which have attained the highest level of assaying expertise.

The Singapore Assay Office (SAO) was launched in November 1979 with the prime aim of implementing hallmarking of precious metal articles in Singapore as well as providing assaying services to local industries. In November 1980, the office was incorporated as subsidiary company of the CIS.

Through the efforts of the SAO in 1980, hallmarking has been accepted voluntarily as a system of independent check on the purity of all gold and silver sold in Singapore.

Jewelry items exported from Singapore are increasingly being assayed by the SAO because local exporters now recognize the need to conform to international standards and to maintain a good reputation world-wide.

Precious metal articles manufactured by jewelers in Singapore are checked and tested by the SAO to ensure that the articles conform to

the prescribed fineness. Tests are made on small samples removed from the articles before they have been polished. The hallmark is only stamped on an article if it has passed the stringent standards set by the SAO. Customs help to control quality.

For companies that are found to have substandard goods, they are first given a verbal warning on first offense, a written warning on second offense and finally confiscation/withdrawal of certificates. The system is jointly implemented with the Singapore Jewellers Association.

Buying articles having the SAO Hallmark assures consumers of the value of the product. They advice that buyers should insist on the SAO hallmark when they purchase jewelry from any jeweller or goldsmith.

Regarding international trade, increase in exports would also entail increase in the need for assaying services. Even if the jewelry for export are found to be of good quality, some overseas buyers would still need to assay them again in their own economy.

Singapore would be ready if there is a proposal to have a standardized assaying and hallmarking system in the APEC region. According to SAO, the jewelry industry in Singapore would welcome it since they are already practicing it.

3.2.10 INDONESIA

There are about 30,000 goldsmiths and jewellers in Indonesia. The Indonesia Jewelry Association has about 3,000 members. The association was established in 1985.

Around 20% to 30% of jewelry produced in Indonesia goes to exports. The rest goes to the local market. In 1997, Indonesia exported fine jewelry amounting to US$104,456,000. Between 1993 to 1997, fine jewelry exports of Indonesia increased by an average annual growth rate of 3.7%.

Testing and Hallmarking Practices in Indonesia

Indonesia applies the general product standards law to the standard on precious metal fineness, according to an official in the Ministry of Industry and Trade. On the other hand, the officers of the industry association believed that the law on fineness and purity of precious metals has been existing since the period of the Dutch Occupation. However, implementation of such law is not strict.

Assaying in Indonesia is usually “kitchen-type” using crude processes, usually touchstone. Goldsmiths do not go to laboratories to have their gold tested since the local buyers do not ask for some certification. Practically, there is no standard on assaying and hallmarking being implemented in Indonesia. Every shop has its own stamp and would just put anything on the jewelry even without validating its content. Consumers just accept it since producers allow buy-back guarantee in that 10% to 50% was taken off from the price and the money will be given back to the customer.

There are existing institutions in Indonesia that have assaying capabilities such as Sucofindo. This center only provides assaying services to miners with gold samples which has 70% concentration. The Indonesian government runs Anekatembang, a smelting facility that also provides assaying services with accompanying certification. This is the only institution that issues certification on gold fineness.

The Indonesia Goldsmiths and Jewelers Association recently started to implement a hallmarking system in the industry. The association lets accredited companies to use the *Logo Standarimasi Mas*, a logo for gold standardization, to be stamped on the jewelry. This is a way to assure consumers that what they buy from accredited companies contain the right amount of gold.

The association started implementing the system with the big companies first because they believe that big companies are already aware and prepared for this type of system. For small-scale firms, it would be rather difficult for the association to ensure quality of products since goldsmiths generally deal with a lot of pieces and make use of hand-made processes such as soldering.

The association’s vision is for the logo to be recognized by Indonesian consumers as an assurance of good quality jewelry. Since the system has just started, it is in the process of revising and improving. At the moment, the association is in the process of converging the karatage use in all regions in Indonesia to produce only 18k to 24k jewelry. Indonesia is huge that each region would use its own set of karats. For example, the eastern region of Indonesia use 23k or 95% gold. In Bali, they have 22K or 916. In Jakarta, firms usually produce jewelry in 18k and 9k gold.

In addition, the association also pushes for stricter hallmarking implementation among its accredited companies with no negative tolerances allowed.

The system would be voluntary and managed by the association. The association accredits companies and gives them the authority to use the national association logo as hallmark in jewelry items. This type of service has a corresponding minimal fee just to cover advertising expenses.

The new hallmarking system that they are setting up in Indonesia only covers the local market. They believe that standardizing a hallmarking system in the APEC region would be difficult considering that foreign buyers do not readily accept what is stamped on the jewelry. The goods would still be sent to their own laboratory for testing. However, for buyers who have long business relationship with another company, not all shipment would go to a testing laboratory for testing since buyer-seller trust has already been established. For items for exports, manufacturing firms usually put stamps to show the karat, company trademark and diamond weight.

The Indonesian Goldsmiths and Jewelers Association expressed its reservation on the government's involvement in the assaying and hallmarking system. However, they welcome government support when it comes to promotion of public awareness regarding the importance of assaying and hallmarking in fine jewelry.

The association also expressed its reservation to make the system mandatory.

3.2.11 PHILIPPINES

The Philippine jewelry industry is engaged in the production and marketing of two major product categories namely, the precious metal jewelry and pearls, precious and semi-precious stones. The precious metal jewelry refers to the jewelry made of gold and silver which may or may be mounted with gemstones and can be in the form of rings, earrings, necklaces, etc. while the pearls and semi-precious stones are unworked or worked pearls, cut and polished diamonds and colored gemstones such as emeralds, rubies and sapphires in loose form. Precious metal jewelry made of gold is the major product in the Philippines. Silver is a smaller portion of the business but its production is steadily increasing.

The Philippines has abundant supply of gold. Annual reports on world gold production and demand by the Consolidated Gold Field Limited ranked the Philippines as the 14th highest gold-producing economy in the world with a production output of 28.4 metric tons in 1995. In Asia,

it ranked the 3rd largest gold producer next to Indonesia and Papua New Guinea. In 1999, the Philippines gold production reached 31,031 kilograms.

Gold, silver, pearls and some precious stones are locally available but the more valuable materials such as diamonds and other precious stones have to be sourced from abroad. Precious jewelry manufacturing is more prevalent than the cutting of stones due to the availability of the major raw materials such as gold and silver. Despite the availability of the gold and capability of the local manufacturers to meet domestic demand, imported jewelry still abound in the local market. A large portion of these are made of gold in various karatage manufactured in Italy (chain), Thailand, Singapore and Hong Kong.

Testing and Hallmarking Practices in the Philippines

At present, there is no existing hallmarking system in the Philippines. However, the Bangko Sentral ng Pilipinas (BSP) gold refinery which is accredited by the London Metal Exchange is equipped to process raw materials in the form of unrefined gold and silver bullion to produce gold bars with purities up to 99.95% as well as silver bars with minimum purity of 92.5%. It also sells 24 karat gold in grains and thin sheets. Assay services are also available at the BSP. However, the cost is prohibitive since the facilities are geared for the testing of bullion rather than jewelry pieces. The facility is not being utilized by the jewelry industry. Instead, purity determination is commonly done using the touchstone method. For most firms, they usually buy their raw materials from trusted suppliers to be sure of the quality. Some manufacturers have started stamping company and fineness marks.

The Philippine Bureau of Product Standards has already developed jewelry standards for jewelry testing using the cupellation method - fire assay for gold and volumetric method using sodium chloride or potassium chloride for silver. These standards were based on the ISO 11426 for gold and ISO 11427 for silver. Also developed were standard which specifies the symbols to be used to identify gold, silver and platinum. Numerals would be used to designate precious metal content. These shall be clearly and indelibly engraved or stamped in the item together with the manufacturer's name, trademark or other identifying mark. Recently, a legislative bill on the establishing an assay, hallmark and gemmological division in a government agency for fine and precious metal jewelry and precious/semi-precious stones is now pending in the Eleventh Congress. The jewelry association is supporting this bill as this will ensure that all locally produced jewelry are at par with world industry standards. Industry players say that with

the bill, this will not only protect the consumers but will also protect the integrity and credibility of the jewelry industry, thereby could earn the economy with a reputation as makers of quality jewelry.

3.3 SUMMARY OF TESTING AND HALLMARKING PRACTICES

The table showing the summary of testing and hallmarking practices in participating APEC economies is shown in Appendix D.

CHAPTER 4

The project was culminated in a two-day **Seminar-Workshop on Fine Jewelry Assaying and Hallmarking Among APEC Economies**. It was held on 18-19 September 2000 at the Hong Kong Productivity Council in Kowloon, Hongkong. A total of about 16 participants representing four APEC economies, namely: China, Hong Kong, the Philippines, and Singapore were in attendance. The list of seminar-workshop participants, organizers and facilitators is shown in Appendix E.

Conceptually, the Seminar-Workshop was composed of three distinct yet interrelated components. These are the : (1) Seminar, a tri-paper presentation feature which provided the essential theoretical inputs on the topics in question to the participants; (2) Laboratory Work, an actual hands-on exposure that gave the participants an opportunity to perform assaying procedures on two (2) precious metals-gold and platinum; and (3) Syndicate Discussion Workshop, a forum where participants had the opportunity to deliberate and build consensus on issues and concerns attendant to assaying and hallmarking of fine jewelry at the micro (member economy) and macro (APEC region) levels.

4.1. SEMINAR--WORKSHOP OBJECTIVES

The seminar-workshop aims to:

- Generate awareness and appreciation on the different hallmarking and testing practices of selected APEC member economies;
- Provide a forum to exchange views on a harmonized and standardized hallmarking system for gold and platinum among APEC member economies;
- Provide inputs on the ISO 11426 process for gold and ISO/DIS 11494 for platinum.

4.2. PAPER PRESENTATIONS

Mr. Franklin Bunoan of the San Eligius Fine Jewellery Training Center in the Philippines presented an overview of the project, objectives, methodology, issues and insights derived from the industry assessment survey conducted by the project team in the ten (10) APEC economies. He also presented a matrix, comparing the assaying practices and hallmarking system in the economies covered by the survey.

Ms Gillian Ho from the SAO presented in detailed fashion Singapore's assaying and hallmarking system, from the time of its inception to the present. She said

that hallmarking is voluntary and emphasized that education had a critical role when the system was being introduced in Singapore.

Dr Wai Yin Lo of the HKJITC provided a technical presentation on the principles and processes of assaying gold and platinum as an introduction to the laboratory work section of the seminar-workshop.

4.3 LABORATORY WORK

The group was subdivided into four working groups. Each group was given a sample to work on. Participants took turns in performing the different tasks required in assaying. The laboratory work followed the procedures prescribed by ISO 11426 and ISO 11494. The samples worked on by the participants were then compared to the samples tested by the staff of Hongkong Productivity Council. For the platinum assay, only one group yielded an outcome which has a reasonable value.

The detailed procedure used in the laboratory work is attached as Appendix F.

4.4. SYNDICATE DISCUSSION WORKSHOP

This section covers the output highlights of the Syndicate Discussion Workshop. For easy reading and understanding, the presentation and discussion of the output highlights have been broken up into sections with the following themes and headings: Issue, Perspectives, Tests, Safeguards, and Action. The worksheet used during the syndicate discussion workshop is attached as Appendix G.

4.4.1 Syndicate Discussion Workshop Highlights

a) Issue

In the context of the Project's short-term and long term goals, i.e. stimulation of increasing trade and investments, enhancement of consumer protection, and sustainment of the fine jewellery industry's growth and development, this discussion theme was considered by the participants by having to respond to the inquiry:

> *Does it become necessary for the fine jewellery industry in the APEC member economies to adopt a standard in :*
>
> *(a) Testing Method?* ____*YES* ____ *NO*
> *(b) Testing and Making Methods* ____ *YES* ____ *NO*

(c) Testing and Hallmarking System ____ YES ____ NO

Exhibit 1 presents the consensual responses to the three-part question.

Exhibit 1. Testing, Hallmarking and System

ADOPTION OF STANDARD -	YES	NO
• Testing Method	✓	
• Testing and Marking Method	✓	
• Testing and Hallmarking System	✓	

Exhibit 1 clearly shows that the participants agree that the fine jewelry industry in the member economies in the APEC region must strive toward the adoption of a standard in testing, testing and marking, and testing and hallmarking system in a progressive way. By adoption of a standard testing method, it is meant that specific assay tests for gold, platinum and silver should be identified as suitable and acceptable procedures across APEC member economies. By adoption of a standard testing and hallmarking methods, it is meant that, in addition to what has just been described, there will also be a common agreement on the required marks to be indicated on assayed precious metals and fine jewelry as well as on the procedures for stamping them. Finally by adoption of a standard testing and hallmarking system, it is meant that, there shall be a creation and operation of an independent and credible body in each member economy tasked to specifically carry out the assay testing and hallmarking functions of precious metals and fine jewellery products.

b) Perspectives

This theme revolved around the consideration and identification of benefits that may potentially accrue to identified stakeholders once the standard for testing, testing and marking, and testing and hallmarking system would have been adopted, installed and made operational across the APEC economies. Gains to five (5) stakeholders, namely: (1) manufacturer, (2) wholesaler, (3) end user, (4) retailer, (5) inter-APEC trade, were analyzed. Exhibit 2 summarizes the identified gains from five (5) perspectives.

Exhibit 2. Stakeholders' Benefits

BENEFITS TO STAKEHOLDERS' -				
Manufacturer	**Wholesaler**	**End User**	**Retailer**	**Inter-APEC Trade**
• Better Communication • Increase Sales • Enhanced Trust and Confidence • Better Competition Climate • Improved Asian image to the West • Product Standardization	• Enhanced Trust and Confidence • More Purchases • Wider Market • Precious Metal Content Standardization • Documentation Facilitation	• Consumer Protection • Enhanced Trust and Confidence • Precious Metal Content Standardization • Value for Money • More Purchases	• Better Competition Climate • Increased Sales • Enhanced Credibility • Precious Metal Content Standardization • Additional Marketing Tool • Buy-Back Scheme • Wider Product Sourcing • Wider Market Options	• Documentation Facilitation • Harmonized Precious Metals Content Standardized • Acceptability of System • Better Competition Climate

Precious Metal Content Standardization (4/5: 4 mention in 5 stakeholders), Better competition climate (3/5), Enchanced trust and confidence (3/5), and Better Increased sales (2/5) are the four (4) benefits that can accrue to more than one (1) stakeholders considered. In terms of the number of benefits identified, the retailer (8 gains) appears to the biggest winner in the testing, marking, and system standardization of fine jewellery in the APEC region.

c) Tests

The trust of this themes' discussion was the identification of the most suitable and acceptable assaying method/s to become the recognized test procedures for gold, platinum, and silver within and among the APEC economies. Exhibit 3 presents the recommended assay testing procedures for adoption as standards.

Exhibit 3. Precious Metals' Standard Assaying Procedures

STANDARD ASSAYING PROCEDURES FOR FINE JEWELLERY METALS		
GOLD	**PLATINUM**	**SILVER**
• Cuppellation (Fire Assay) Method • ICP (for 24K)	• ICP • Gravimetric Method	• Titration • Gravimetric Method

Other relevant issues, i.e. resolution of disputes, acceptable tolerance levels, and accreditation by APEC of assay and hallmarking bodies in member economies are to be referred to an APEC body, hereby being recommended for creation, called the Gem and Fine Jewellery Technical Committee.

d) Safeguards

The discussion of the theme led to the identification of four (4) possible configurations of assaying and hallmarking bodies that may be established in the APEC member economies. These are: (1) Purely Government- Operated Assay Office; (2) Government-Supervised/ Accredited Assay Office; and (4) Government-Supervised/Industry-Operated Assay Office. The participants stopped short of identifying and recommending a particular and specific Assay Office arrangement since, it was highlighted and underscored that the wide differences in the political, economic and social frameworks prevailing in the APEC member economies justify and necessitate a more flexible policy on the issue.

In order to safeguard, however, the integrity and credibility of the Assay Office established, the participants recommended that certain quality assurance certificates/indicators must be obtained by the Assay Office. Exhibit 4 gives a summary.

Exhibit 4. Assay Office Credibility Indicators

ASSAY OFFICE CREDIBILITY INDICATORS	
For System Quality Assurance	**For Technical Competence of Laboratory**
ISO 9000	ISO 17025

e) Action

Action on four (4) fronts were recommended by the participants as they considered this theme, which focused on the identification of strategic interventions that will lead to the full adoption of standards set in areas under the first theme - ISSUE. The action fronts are : (1) Information Dissemination/Advocacy, (2) Training, (3) Policy Recommendation - Member Economy Level, and (4) Policy Recommendation – APEC Level Exhibit 5 provides the discussion synthesis.

Exhibit 5. Interventions Towards Standardization

AGENDA FOR ACTION	
Action Front	**Recommended Intervention**
• Information Dissemination/ Advocacy	• Consumer Education activities to be undertaken by World Gold Council, Platinum Guild, and Silver Guild • Targeted (or directed) circulation of research studies' on Assaying and Hallmarking participants • Wide circulation of Standards/Guidelines set by the Gem and Fine Jewellery Technical Committee
• Training	• Assaying and Hallmarking Techniques
• Policy Recommendation – Member Economy Level	• Establishment of an independent Assay Office in each member economy
• Policy Recommendation – APEC Level	• Creation of the APEC Gem and Fine Jewellery Technical Committee • Sharing of technical and commercial expertise among economies • Regular conduct of conferences and consultation with the industry

The recommendations for action have been formulated by the participants to provide all concerned with a menu of doable intervention possibilities that will bring the current state of assaying and hallmarking practices in each member economy to a regime of standardization.

CHAPTER 5

5.1 CONCLUSION

The hallmarking and testing practices applied to precious metal jewelry vary among APEC economies. These include the technology and equipment, the entities which carry out the testing as well as the regulatory bodies that look after the system.

There appears to be a direct correlation between hallmarking system and size or growth of fine jewelry industry. It may be said that Japan and Singapore have a hallmarking system with similarities to the UK model. On the other hand, Hong Kong, Thailand and Malaysia have very strong private sector-based guarantee system. These economies belong to the top 24 world exporters of fine jewelry.

Most key respondents believe that the UK model is too cumbersome. The Japanese industry leaders had the same experience with the Japanese Mint Bureau which led the private sector to police its own ranks. Public confidence on the JJA marks while still lower than the Japan Mint Bureau mark, are steadily and rapidly growing. In Singapore, while no statistical data was available, the acceptance of the "Singapore Gold" was believed to have dramatically increased with the SAO mark especially for the tourist trade. Again, most respondents agree that sales would increase once the *caveat emptor* atmosphere or when the buyer purchases at his/her own risk in the jewelry trade is removed and the buyer's confidence buoyed.

To achieve this, the following could be looked into by the APEC members:

- Common use of descriptions and terminologies of jewelry products
- Harmonization of testing methods including inter-APEC technology assistance
- Mutual recognition of industry marks
- Mutually accepted and respected legal avenues for disputes
- Accreditation of assaying offices in member economies.

The key word here is to increase buyer confidence which means increased consumer protection should go hand-in-hand with these efforts.

The USA remains a major market for jewelry and while it does not have a strict hallmarking system, consumer awareness and protection avenues

are quite high. Thus, even if 47% of consumers do not feel confident about the jewelry they purchase, they know that they have legal avenues which they can go to.

The project has generated awareness among the participants on the different jewelry testing and hallmarking practices. It has given them insights into internationally-adopted testing methods. Today, bigger manufacturers may feel that they have the trust of their big wholesaler buyers. But these wholesale buyers still sell to retailers and retailers sell to direct consumers. At the end of the line, the voice of the direct consumer must be heard. His/her need must be addressed.

APPENDICES

APPENDIX A

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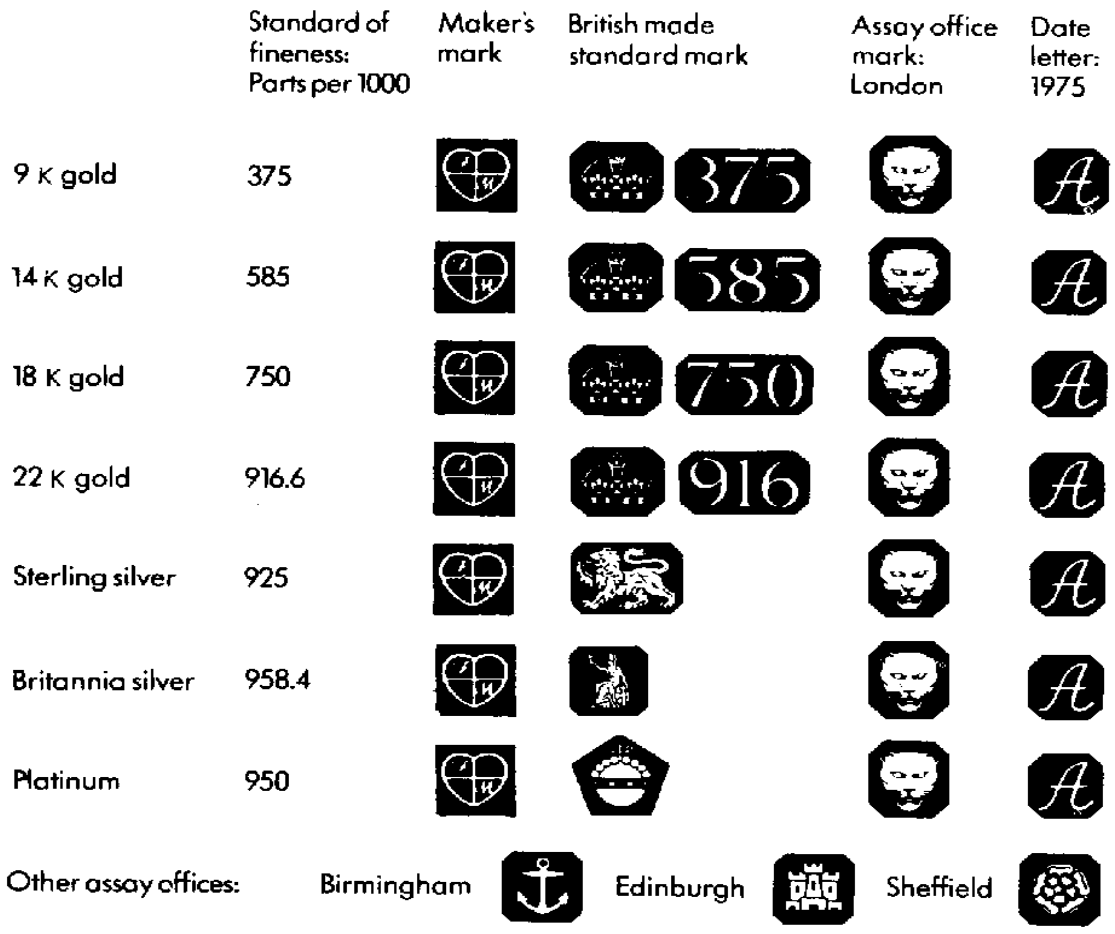
APPENDIX B

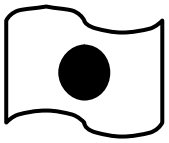
Samples of Hallmarks

United Kingdom



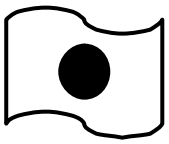
Japan

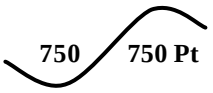
a. Japan Mint Bureau



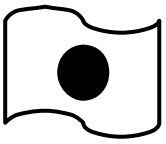
Assay Official Mark

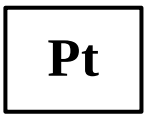
Fineness Mark (Gold)





Gold and Platinum





Platinum

b. Japan Jewelry Association

750

Fineness

JJA Accreditation Mark

J v

Producers Mark

Singapore

Jewellers Mark	Assay Office Mark	Standard Mark (91.6% 22 carat)	Reference Code

Switzerland

APPENDIX C

List of Respondents in Key Informant Survey and Focused Group Discussion

COMPANY NAME	CONTACT PERSONS	CONTACT NOS.
UNITED STATES OF AMERICA		
A Electronic Bonding Inc. (ABI) 1655 Elmwood Avenue Bldg. #7 Cranston, Rhode Island	Mr. & Mrs. Parl & Janet Kirk	
Gold International Machiner Corporation Thurston & Newell Streets P.O. BOC 998 Pawtucket, Rhode Island	David M. Gold President	Mary E. Miller V.P. - Administration
Rhode Island Economic Development Corporation One West Exchange Street Providence, Rhode Island	Katherine Tufts Associate International Trade Director Lenny Roseblatt CFI International Industry Expert	
S. O. Accurate Group, Inc. 236 W 30th Street, New York 10001	Rick Hoff	
CHINESE TAIPEI		
China External Trade Development Council 5th Fl., CETRA Tower, 333 Keelung Road, Sec. 1 Taipei, Taiwan, 110 ROC	Manson M.S. Cheng Project Manager Consumer Goods Section Market Development Department	Tel.: (886-2)275-5200 Ext. 541 Fax: (886-2)2757-6443 E-mail: manson@cetra.org.tw Internet:http://www.cetra.org.tw
Dream Diamond No. 10, Lane 269, Hs in Shu Road, Hs in Chuang City Taipei Hsian, 242 Taiwan, ROC	Ken Huang President	Tel.: (02)2202-8211 ext. 10 Fax: (02)2202-8372

Milano Jewelry 145, Sec 4, Jen Ai Road Taipei, Taiwan	Allan Sze	Tel.: (886-2)2731-8899 Fax: (886-2)2731-8233 Mobile: (886-0)9331-33134 E-mail: szes@gcn.net.tw
Fareast Gem Consultant Ltd. 6F-H, No. 50, Sec. 4 Jen Ai Road, Taipei ROC	Ai-Hsin Lin Graduate Gemologist, G.I.A. Yeh Hsien-Chin Graduate Gemologist, G.I.A.	Tel.: 7028142 – 3
HONG KONG, CHINA		
Hong Kong Jewelry Manufacturer's Association Unit G, 2/F, Kaiser Estate Phase 2, 51 Man Yue Street Hunghom, Kowloon, Hong Kong	B. K. Chow General Manager	Tel.: (852)21225088 Email: bkchow@jewelry.org.hk Fax : (852)23623647
Nelson Jewellery Arts Co. Ltd. Hong Kong Headquarters 2/F, Guardforce Centre 3 Hok Yuen Street East Hunghom, Kowloon , Hong Kong	Nelson Ho Managing Director Michael Luk General Manager	Tel. : (852)23622888 Fax : (852)27644028 E-mail: michael@nelson-jewellery.com
Hong Kong Productivity Council HKPC Building 78 Tat Chee Avenue Kowloon, Hong Kong	Dr. Yeung General Manager, Chemistry & Metallurgy Division Dr. W.Y. Lo Consultant Chemistry & Metallurgy Division Dr. Ricky Y. C. Tsui Consultant Chemistry & Metallurgy Division	Tel. (852)27885678 Fax: (852)27885522 Tel.: (852)27885520 Fax: (852)27885522 Tel.: (852)27885527 Fax: (852)27885522

INDONESIA		
Ministry of Industry and Trade Directorate General of Metal, Machinery, Electronics and Multivarious Industries Jl. Gatot Subroto Kav. 52-53 9th Floor Jakarta 12950	Agus Tjahajana Wirakusumah Director General Dr. Budi Darmadi Secretary of Directorate General	Tel.: 5252482, 5255509 ext.4036 E-mail: darmadi@pusdata.dprin.go.id Telp.: (021) 5251127 Fax. : (021) 5252978 e-mail: agus@pusdata dprin.go.id
PT NARASENI PERKASA Jl. Maligi II Lot E – I Kawasan KIIC Karawang Jawa Barat (41361) Telp.: (021) 8904395 – 89107050	Leo J. Susilo General Manager Joel Z. Fain Factory Manager	HP 08161356396 E-mail : joel-fain@hotmail.com Fax. : (021) 89107049 e-mail: naraseni@cnbn.net.id
SUCOFINDO PT. (Persero) SUCOFINDO Main Laboratory Jl. Arteri Tol Cibitung Cibitung Bekasi 17520 P.O. Box 4	Ir. KUSMUTARTO BASUKI General Manager KEMAL MUSTAFA Deputy General Manager	Phone: (62-21) 8832 1176 (Hunting) (62-21) 8832 1167 (Direct) Fax : (62-21) 8832 1162 (Hunting) e-mail: sucolab@ibm.net Phone: (62-21) 8832 1176 (Hunting) Ext. 1205 (62-21) 8832 9364 (Direct) Fax : (62-21) 8832 1162 (Hunting) e-mail: Wakalab @ibm.net
PT. Duta Bintang Permata Jl. Raya Kebayoran Lama 18 Jakarta 11560 Indonesia	Rozano Pitoyo General Manager	Tel.: 7256233 - 35 Fax : 7256232
P.T. Sinar Budi Mega Perkasa Gold & Silver Jewellery Manufacture Jl. Semboja 15 Jakarta 10130 P.O. Box 1888/JKT 10018	Budi Tjahyadi Deputy Chairman	Tel. 021 – 3849909, 3808788 Fax : 021 – 3804347, 6348691

ASOSIASI PENGUSAHA EMAS & PERMATA INDONESIA (Indonesia Goldsmiths and Jewelers Association) 2201 Gajah Mada Tower JL Gajah Mada No. 19 – 26 Jakarta 10130, Indonesia	Johnny Salmon President Iskandar Husin, SH. Executive Secretary	Phone: (021) 6340863 (021) 2311011 Ext. 0420 Fax : (021) 6345105
IMC JEWELRY Exporter and Manufacturer of Fine Jewelry Kompleks Green Ville Blok AW 15-16 Jakarta 11510	Tony Tandiary	Phone : (021) 5633630 (Hunting) Fax : (021) 5605649 e-mail : imcxl@indo.net.id.
JAPAN		
Japan Jewellery Association 5F Jeweller's Town Aurum 26-2 Higashiueno 1-Chome, Taito-Ku, Tokyo 110-8626, Japan	Haruo Miyashita Executive Director Hiroshi Yamada Councilor	Tel.: 813-3835-7891 3835-8567/8633 Fax: 813-3839-6599
GIA Japan AGT Gem Laboratory Okachimachi Cy Bldg. 5-15-14 Ueno Taito-Ku, Tokyo, Japan Nagahori Community Bldg. 2-5-8 Minami-Senba Chuo-Ku Osaka, Japan	Yoshiko Doi President Hiroo Miyamoto Instructor	Tel.: 03(3834)6586 Fax : 03(3834)6589 Tel.:06(6266)8601/8530 Fax:06(6266)9037
Mint Bureau Tokyo Branch 4-42-1Higashi Ikebukuro Toshima-ku, Tokyo 170-0013	Masahiro Takahasa Manager, Assay Department Fusajiro Yamamot Section Chief, Archives Section	Tel.: 03(3987)3131 Fax 03(3981)9533
Yamanashi Industrial Technology Center 2094 Ohtsu-cho Kofu-shi Yamanashi 400-0055	Dr. Nobute Ayusawa, General Manager	

JMRB Research International Harmony Tower 9F 32-2 Honcho 1-chome, Nakano-ku, Tokyo 164	Saeko Akasa Project Management	Tel.: 81-3-5365-6801 Fax: 81-3-5365-6881
Pan Asia Trading Corporation 302 Sankyo Building Kojimachi Annex 1-3 Kojimachi, Chiyoda-ku Tokyo 102-0083 Japan	Tamio Ijiri Director	Tel.: 81-3-3239-0273 81-3-3239-0308 Fax: 81-3-3239-0319 E-mail: patc@mva.biglobe.ne.jp
De Beers 9F, Harmony Tower 1-32-2 Honcho Nakano-ku Tokyo 164-8721	Ms. Saeko Akasa Jewelry Data Bank	Tel.: (03) 5365-6801 Fax : (03) 5365-6881
KOREA		
Korea Jewelers Association, Inc. Rm. 52, BIF Janggyo Bldg. Janggro-dong 1, Chung-gu, Seoul	Hong Shil President Hyun-Sun Shin Asst. Director Han Jong Chan Director of Business Dept.	Tel.: 776-9989 Fax: 774-9972
The Precious Metal & Gem Trade Laboratory of Korea Rm. 209, Changgok Bldg. 194 Wonman-dong Chongno-gu, Seoul	Jun-Gu Lee President Kang-Eun Nam	Tel.: 734-3920 Fax: 764-5824
Korea Jewelry Manufacturers Association 5/F Youngdong Bldg. 117-2, Bongil-dong Chongno-gu, Seoul	Tae-Soo Kim President Jung-Nam Jung Yoo-Sung Yoon	Tel.: 766-4622 Fax: 766-1589
Seoul Precious Metals Manufacturers Co-operation 5F, Youngdong Bldg. 117-2 Bongil-dong Chongno-gu, Seoul	Hyun-Soo Kang Executive Director	Tel.: 766-1588 Fax: 745-8577

Lee Gold Co., Ltd. 624-4 Seoam-ri Tongjin-myun, Kimpo Kyunggi 415-860, Korea	Tae Woo Lee Managing Director	Tel.: 82-341-987-6000 Fax: 82-341-987-8700
MALAYSIA		
Ministry of International Trade and Industry Industries Division 8th Floor, Block 10, Government Offices Complex, Jalan Duta, 50622 Kuala Lumpur, Malaysia	Alagasan A/L Gadigaselam Principal Assistant Director	Tel.: 03-6516022, 6510033 D/L: 03-6524745 Fax: 03-6512341 / 6512302 Telex: MA 28017 e-mail: alagasan@miti.gov.my
SIRIM QAS Sdn. Bhd. Building 4, SIRIM Complex 1, Persiaran Dato Menteri P.O. Box 7035, 40911 Shah Alam, Malaysia	Abd. Rahim Wasik Certification Executive Product Certification	Tel. : (603) 5567419 Fax : (603) 5567484 e-mail: abd.rahim_wasik@pop.it.sirim.my arwasik@hotmail.com
Goldsmith and Jewellers of Wilayah Persekutuan A-15-6 Seputih Permai Condominium Jalan Taman Seputih 58000 Kuala Lumpur	Tham Ah Ngan	Tel.: 03-22731337 22741096 Fax :03- 22740968
Cheong Loong Goldsmiths Sdn. Berhard 46-48 Lebuh Campbell 10100 Penang, Malaysia	Tham Yen Thim Managing Director	Tel. : 604-261 1141 Fax : 604-261 9268
Lai Wah Goldsmiths Sdn. Bhd. (1238-V) No. 53/55 Campbell Street 10100 Penang, Malaysia	F.K. Lo Chairman & Managing Director	Tel.: 04-2610900
Goldsmith and Jeweller Association of Wilayah Persekutuan, Selangor, Negeri Sembilan dan Pahang. 89, 4th Floor, Jalan Sultan 50000 Kuala Lumpur Malaysia	Shum Seng Kam Executive Secretary	Tel.: 603-2384892 Fax : 603-238485 Handphone: 010-6627229

Fook On (Goldsmith) Co. Sdn. Bhd. No. 98 Jalan Tun H. S. Lee 50000 Kuala Lumpur	Yim Shee Wai Managing Director	Tel & Fax : 03-2385867 H/P: 012-2330260
FEDMAS ASSAY OFFICE SDN. BHD. The Penang Gold & Jewellery Exchange Centre 122-1-7, Jalan Sungai, 10150 Penang Malaysia	Wong Kok Kee General Manager	Tel.: 04-281-9182 Fax : 04-281-9182
Wing Kwong Co. Sdn Bhd Goldsmiths & Jewellers Head Office: 118 Jalan Tun H. S. Lee 50000 Kuala Lumpur Branch Office: 21 Leboh Pudu, 50050 Kuala Lumpur, Malaysia	Chui Tai Yan Executive Director	Tel.: 603-238 5014 (DL) 603-238 4453 Fax : 603-201 8982 Tel.: 603-238 7528
Habib Corporation Bhd. Lot 106, Lorong Mamanda 2 Ampang Point 68000 Ampang, Selangor Darul Ehsan, Malaysia	Meer Sadik Habib Managing Director	Tel.: 03-456 5610 (DL) Fax : 03-452 2143 Mobile: (6) 012-2222-916 e-mail: meerha@tm.net.my
Gemas Precious Metals Industries S/B No. 33 Jalan 2/131A Project Jaya Industrial Estate, Batu 6, Jalan Kelang Lama 58200 Kuala Lumpur	Ng Yih Pyng Executive Director Chan Kah Hui Marketing Director	Tel.: 603-7923730 7919280 Fax: 603- 7948433 e-mail: ng@tomei.po.my Mobile: (65) 9761 4764 Fax : 7923182
TOMEI Gold & Jewellery Holding (M) Sdn. Bhd. 14-2, Jalan 2/131A Project Jaya Industrial Estate, Batu 6, Jalan Kelang Lama, 58200 Kuala Lumpur	Ng Yih Pyng Executive Director Datuk Ng Teck Fong Executive Chairman	Tel.: 603-77848136 Fax : 603-77848140 Hand Phone: 012-3378090 e-mail: ng@tomei.po.my Web Site: www.tomei.com.my/tomei

Malaysian Industrial Development Authority 3rd Floor, Wisma Damansara Damansara Heights, Jalan Semantan 50490 Kuala Lumpur	Haji Mohd. Hanafiah Hussein Deputy Director Textile & Miscellaneous Industries Division	Tel.: 03-259 5551 (Direct) 03-255 3633 (General Line) Fax : 03-253 8460
PEOPLE'S REPUBLIC OF CHINA		
China National Gemstone Testing Center No. 19 Xiaohuangshuang Road Andingmenwai Street Beijing 100013 P.R. China	Li Jingzhi Guo Tao Gao Yan	Tel.: (861)84273637 84274008 Fax: (861)84273869
Beijing Ploy Pailin Jewelry Ornament Co., Ltd. No. 1 Zuojiazhuang Qianjie Chaoyang District Beijing, China	Alex B.H. Ooi Sales & Marketing Manager	Tel (86)10-64669734 64638202 Fax (86)10-64638203
Gemmological Association of China Chengdu Dongfang Pearls & Jewels 64 Funei Dajie Xisi Beijing, China	Li Jingsong General Secretary, Professor	Tel.: (10)661-75419 66165566- 8825
G.A.C. Deputy President N.C.M.R. Examinier M.E.C.C. Committee 5 jia Xijie Yuetan XiCheng Qu Beijing, China	He Fa Rong Professor	Tel.: (10)68048935 68016765-8316 Fax : (10)68048935
Association of Gemstones PROC	Professor Wu	Tel.: 6801-2966-8312

PHILIPPINES		
Sterling Selection Corporation 55-A 11th Street. Mew Manila Quezon City	Mia S. de Faustman Owner	Tel..: 721-0015 / 722-8542
SANARA, Inc. No. 29 F. Ocampo Avenue Pamplona, Las Piñas City	Benjamin M. Aragon Owner	Tel. 872-9987
Meycauayan Jewelry Industry Assosciation Meycauayn, Bulacan	Cecila R. Ramos Chairman	Tel.: (044)840-7361
SINGAPORE		
Singapore Test Services Pte Ltd A subsidiary of Chartered Industries of Singapore 249 Jalan Boon Lay Singapore 619523	Yong Kuek Siong Ph.D. Director/General Manager	Tel.: 660 7317 (D) / 2651066 Fax : (65) 212617 Website: http://www.ststest.st.com.sg e-mail: yongks@sts.st.com.sg
Singapore Assay Office 249 Jalan Boon Lay Singapore 619523	Gillian Ho Manager	Tel.: 6607331 / 2616418 (D) Tel.ex: RS 38951 CIS Fax : 2612617
Showroom: 133, New Bridge Road #01-17 / 18 Chinatown Point Singapore 059413 Office: 133, New Bridge Road #10 – 10 Chinatown Point Singapore 059413	Simon Ng Miang Gee	Tel.. : 5342333, 5340183 Fax : 5341668 Tel. : 5388311 Fax : 5388366
Creative Jewellery Pte Ltd 304 Orchard Road #01-81/82 Lucky Plaza Singapore 238863	Bernard Tan Managing Director	Tel.: 7320059, 7346733 Fax : 7343638

THAILAND		
Thai Gem and Jewelry Traders Association 942/152 Charn Issara Tower 15th Floor Rama 4 Road, Bangrak Bangkok 10500	Mr. Pichait Palanugool Vice President	Tel. : 2353039, 2675233-7 Fax : 2353040, 2675238 Private Line : 318-0771 Fax : 318-0774
Bangkok Assay Office Co., Ltd. Gemopolis 47/42 Moo 4 Sukhapiban 2 Road Prawet, Bangkok 10260	Sukon Tantinuntron Production Manager	Tel.: (662) 727-0214 Fax: (662) 727-0217
BEAUTY GOLD CO., LTD. Head Office: Gemopolis 47/42 Moo 4 Sukhapiban 2 Road Prawet, Bangkok 10260 Thailand	Patcharin (Pat) Palanugool Marketing Manager	Head Office: Tel.: (662) 727-0214 – 16 Fax: (662) 727-0217
JJ-DEGUSSA (T) Ltd. 23/110-113 Sorachai Bldg. 25-28th Floor Soi Sukhumvit 63 (Ekamai), Sukhumvit Road North Klongton, Wattana, Bangkok 10110 Thailand	Chartree Denphutaraphrechar Department Manager – PM Alloys & Refining	Tel.: (662) 714-3969 Fax : (662) 714-4224 Mobile: (01) 495-3943 e-mail: Chartree Denphutaraphrechar@jjdegussa thai.com
Pranda Jewelry 333 Soi Rungsang, Bangna- Trad Road, KM. 2.3 Bangna, Prakanong, Bangkok 10260 Thailand	Prayoon Talerngsri President	Tel.: 361-3311 (12 lines) 393-8779 (8 lines) Fax : (662) 399-4877

PHILIPPINE TRADE AND INDUSTRY OFFICES

UNITED STATES OF AMERICA		
Philippine Trade & Investment Promotion Office Philippine Consulate General Philippine Center 556 Fifth Avenue, New York	Romulo V. Manlapig Special Trade Representative	Tel.: 1212-575-7925 Fax 1215-575-7759 E-mail: strny@ix.netcom.com

CHINESE TAIPEI		
Manila Economic and Cultural Office (MECO) 4th Floor, 107 Metrobank Plaza, Chung Hsiao East Road, Section 4 Taipei, Taiwan	Kenneth T. Yap Commercial Attache Carol Chao Investment Officer	Tel.: 886-22-778-5827 Fax: 886-22-778-5726 E-mail: mtic@transend.com.tw
INDONESIA		
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JAPAN		
Philippine Trade & Investment Promotion Office Embassy of the Philippines 11-25 Nanpeidai-machi Shibuya-Ku, Tokyo, 150 Japan	Roman G. Baltazar Commercial Counsellor	Tel.: 813-3462-1216 813-3462-1605 Fax : 813-3462-4457 E-mail: rpexpinv@gol.com
KOREA		
Philippine Trade and Investment Promition Office Diplomatic Center 9/F 1376-1 Seocho Dong Seocho Ku, Seoul, Korea	Zafrullah G. Masahud Commercia l Attache	Tel.: 822-573-5123 573-5124 Fax: 822-573-5125 E-mail: dtisel@soback.kornet.nm.kr

MALAYSIA		
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PEOPLE'S REPUBLIC OF CHINA		
Philippine Trade & Investment Promotion Office Rm. 431, White Swan Hotel Shamiam Island Guangzhou, Guandong	Agustin C. Mangila, Jr. Commercial Attache	Tel.: 8620-8188-6968 Fax : 8620-8186-1188
SINGAPORE		
Philippine Trade & Investment Promotion Office 400 Orchard Road No. 06-12 Orchard Towers Singapore 238875	Eugene C. Reyes Commercial Attache Marlene Yana Trade Assistant	Tel.: 65-887-3186 Fax : 65-734-4539 E-mail: dticasin@singnet.com.sg
THAILAND		
Office of the Commercial Counsellor Embassy of the Philippines 760 Sukhumvit Road Amphur Phra Kanong, Bangkok 10110 Thailand	Bubpha Vacharapong Trade Assistant	Tel.: 662-258-5382 Fax : 662-261-6869 E-mail: ptipobkk@samart.co.th

APPENDIX D

Summary of Testing and Hallmarking Practices in Participating APEC Economies

ECONOMY	ASSAYING and HALLMARKING SYSTEM	GOVERNING LAWS/POLICIES	ASSAY OFFICES/ IMPLEMENTING BODIES	ASSAY METHOD/ STANDARDS	REMARKS
SOUTH KOREA	Voluntary-industry led government assisted	Product Quality Control Law 1994	• Korea Jewellers Association (KUM) • Precious Metal and Gem Trade Laboratory (Taeguk) • Precious Metals and Jewellery (Mugunghwa	Cupellation XRF Touchstone	
INDONESIA	Voluntary-mostly industry supervised (LOGO STANDARIMASI MAS)	Consumer Protection Law	• Indonesia Jewelry Association	Cupellation	
PHILIPPINES	Firm-based; Fineness and maker's mark only	Consumer Act	• Bureau of Product Standards	Cupellation	
THAILAND	Voluntary-industry led	Consumer Protection Law	• Bangkok Assay Office • Degussa (Thailand) • Consumer Protection Board	Cupellation Atomic Absorption Spectrometry X-ray Analysis	
SINGAPORE	Voluntary-industry led government accredited	Consumer Protection related policies	• Singapore Assay Office ((SAO) • Singapore Jewellers Association	ISO 11426 ISO 11494	SAO is accredited/ mandated by the Singaporean Accreditation Council

ECONOMY	ASSAYING and HALLMARKING SYSTEM	GOVERNING LAWS/POLICIES	ASSAY OFFICES/ IMPLEMENTING BODIES	ASSAY METHOD/ STANDARDS	REMARKS
JAPAN	Voluntary- government and industry facilities	Fineness Certification of Precious Metal Wares (Feb. 1996) Consumer Protection Laws	• Japan Mint Bureau • Japan Jewelry Association	ISO 11426 ISO 11494	
CHINA	Marking is apparently mandatory and state supervised	GB 11887-89 - Jewellery Fineness of Precious Metals and Descriptions Consumer Protection related Policies	• National Gem Testing Center • Beijing Precious Metal Inspection Center • National Jewellery Quality Supervision Inspection • Quality Supervision Division Shanghai Bureau Technical Supervision	Cupellation Spectrometry ISO 4524/4	There are about 70 state accredited assay facilities nationwide
MALAYSIA	Voluntary- industry supervised government accredited	Trade Descriptions (Articled of Precious Metals) Regulations 1994	• Federation of Goldsmiths and Jewellers Association of Malaysia (FEDMAS) • Ministry of Domestic Trade and Consumer Affairs	ISO 11426 ISO 11210 for Platinum	There is move to amend Trade Description Regulation to make marking compulsory
HONG KONG	Marking is mandatory	Trade Description (Marking Gold and Gold Alloys) Order 1984 Trade Description (Marking - Platinum) Order 1988	• Customs and Excise Department • Industry Associations • Hong Kong Jewellery Technology Center	ISO 11426 ISO 11494 ICP	

ECONOMY	ASSAYING and HALLMARKING SYSTEM	GOVERNING LAWS/POLICIES	ASSAY OFFICES/ IMPLEMENTING BODIES	ASSAY METHOD/ STANDARDS	REMARKS
CHINESE TAIPEI	Firm-based; individual Certifications	Consumer Protection Laws CNS 2968: Composition and Marking Requirements for Metals of Jewellery	• National Bureau of Standards • Bureau of Commodity Inspection and Quarantine (Arbiter for imported items	CNS 7290 - Methods for Determination of Gold and Silver in Crude Bullion	
CANADA	Voluntary - industry led	Guide to the Precious Metals Marking Art and Regulations - June 1996	• Assay Department of the Royal Mint	Cupellation - ASTM 1335	
USA	Voluntary - industry led	Guides for the Jewelry Industry - February 1979	• ABI Precious Metals • Jewelers Vigilance Committee	Fire assay (Cupellation) X-ray Fluorescence Atomic Absoption Spectroscopy	

APPENDIX E

List of Seminar-Workshop Participants, Facilitators and Organizers

Participants	Company	Contact Nos.
China		
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APPENDIX F

Detailed Procedure of Assaying Workshop (Laboratory Work)

I Gold Assaying - Cupellation ISO11426: 1997(E)

1.1 Application and limitations

Cupellation is applicable for testing the purity of gold in gold alloys or bullions.

This method is destructive in nature and requires skilful operators.

1.2 Date of Publication: 1997

1.3 Scope

Cupellation (fire assay) is a determination method for analysis gold in gold jewellery alloys. The gold content of the alloys should preferably lies between 333 and 999 parts per thousand (‰). The procedure is applicable specifically to gold alloys incorporating silver, copper and zinc. Some modifications are indicated where nickel and/or palladium are present in the so-called white gold alloys, as well as for alloy containing 990 or more parts per thousand (‰) of gold.

1.4 Principle

The gold alloys are inquarted with silver, compounded with lead and cupelled in a cupellation furnace until a precious metal button is obtained. After flattening and rolling, the silver is extracted (parted) in nitric acid and the gold is weighed. Possible systematic errors in the procedure are eliminated by assaying standard proof samples in parallel. White gold alloys containing palladium and/or nickel require some procedural changes.

1.5 Reference Standard

The following method is based on the standard ISO/11426: 1997(E)

1.6 Equipment for Cupellation

i) Cupellation furnace (up to 1200°C)

ii) Muffle furnace (for annealing) (up to 1200°C)

iii) Analytical Balance (readability 0.01 mg)

iv) Changing tools

v) Hot plate (for preheating cupel)

vi) Gas burner

vii) Oven (for drying of cornets) (up to 500°C)

viii) Platinum parting tray

ix) Silica parting thimbles

x) Roller mill

xi) Hammer and anvil

xii) Magnesium oxide cupels, usually of diameter 22 mm to absorb 6 g of lead, usually of diameter 26 mm to absorb 10 g of lead, or blocks of cupels of similar absorption

xiii) Assay cleaning brush of stiff bristle or nylon but not brass

1.7 Reagents

i) Nitric acid, 33% (m/m), ρ_{20}=1,2 g/cm³, free of halide.

ii) Nitric acid, 49% (m/m), ρ_{20}=1,3 g/cm³, free of halide.

iii) Lead, assay grade, free of precious metals and bismuth, as foil, beads or tablets.

iv) Silver, for inquartation, minimum purity 999,9 parts by mass per thousand (‰), free of gold and platinum group metals.

v) Pure gold, for proof samples,

- for determination of gold between 333 and 990 parts per thousand (‰) by mass, minimum purity 999.9 parts per thousand (‰) by mass;
- for determination of gold more than 990 parts per thousand (‰) by mass, minimum purity 999.99 parts per thousand (‰) by mass.

vi) Palladium, for proof samples, minimum purity 999,9 parts by mass per thousand (‰), free of gold and other platinum group metals.

vii) Nickel, for proof samples, minimum purity 999 parts by mass per thousand (‰), free of gold and platinum group metals.

viii) Copper, foil or wire, minimum purity 999 parts by mass per thousand (‰), free of gold and platinum group metals.

ix) Borax, ($Na_2B_4O_7$), anhydrous.

1.8 Sampling Procedure

The sampling procedure for gold jewellery alloys shall be agreed upon until a corresponding standard method has been published.

For coated articles, appropriate precautions that have been agreed upon shall be taken, to exclude the coating from the determination.

1.9 Procedure

1.9.1 Yellow Gold Alloys

i) Samples are cleaned with acetone or other suitable solvent to remove any grease contaminants. The solvent is then decanted and the sample is allowed to dry with gentle heat.

ii) Transfer at least two samples of the alloy; the nominal weight of sample should be within the range 125 to 250 mg weighed accurately to nearest 0.01 mg.

iii) The sample is wrapped in a piece of pure lead foil. The mass of foil should be at least 4 g for yellow gold samples up to 200 mg, and 6 g for samples from 201 mg to 300 mg (250 mg). Add sufficient pure silver equivalent to 2.3 and 3 times of the weight of gold present in the sample (Note (i)). The lead foil and contents are rolled and compressed into a tight ball.

iv) At least two proof assay is also prepared containing proof gold (Not less than fineness 999.9) with pure silver and copper in such quantities that the composition of the proof assays are approximately the same as the sample assay (or assays). The proof assay and sample assay/s are cleaned in an identical manner in all subsequent operations.

v) The lead balls are transferred to magnesium cupels which have been preheated in a cupellation furnace to at least 1000°C. The proof assay are being positioned as close as possible to the corresponding sample assay. This temperature is maintained at 1050°C to 1150°C until cupellation is completed under oxidizing condition (about 25 mins).

vi) After completion of cupellation, the cupels are taken out from the furnace and allowed to cool until the gold/silver buttons solidified. The buttons are individually removed from the cupels and brushed the underside to remove adherent cupel material. They are then flattened, annealed and rolled into thin elongated fillets with thickness 0.12 to 0.15 mm. After further annealing the fillets are rolled into cornets without being

touched with the bare fingers and the cornets are then placed in the thimbles of the parting tray.

vii) The tray is slowly immersed in nitric acid 33% (m/m) at a temperature at least 5°C below boiling point. The acid is brought to boiling and allowed to boil gently for 15 minutes or until the evolution of nitrous fumes has ceased whichever is longer. The tray is then removed from the acid, rinsed in warm distilled water and immersed in a second bath of nitric acid 49% (m/m), and boil gently for 15 minutes.

viii) The tray is removed from the acid, wash, immerse in another bath of nitric acid 49% (m/m) and boil for 10 minutes. Then the tray is removed from the acid, rinsed in warm distilled water (60°C to 70°C) until completely free from silver nitrate and allowed to dry. The tray is finally placed in a muffle furnace at 700°C to 750°C for 5 minutes. The cornets are allowed to cool and then weighed.

Note (i) If the sample is a gold alloy with a high silver content, then the quantity of inquartation silver is reduced proportionately. When the sample is an alloy of low copper content, a small amount of pure copper is also added.

1.9.2 White Gold Alloys Containing Nickel

If nickel is present, cupellation with additional lead is preformed for verification.

It is difficult to extract all the nickel in the alloy into the cupel by using the standard quantity of lead. Effective cupellation requires an additional 4 g of lead and the use of larger cupels. This extra lead may be incorporated at the start of the test, if the cupel is large enough to contain the increased volume of melt. Alternatively (preferably) a button of lead is added to the hot precious metal bead in the cupel after the lead oxide fumes from the initial operation have ceased. Care is needed if the cupellation furnace is not adapted for this addition.

The proof assays should contain approximately the same proportion of nickel as the sample

1.9.3 White Gold Alloys Containing Palladium (without Nickel):

For white gold alloys containing palladium, traces of this metal may remain in the cornet after a

single cupellation and parting. With these alloys, the cornets from the sample and the proof assays should be recupelled with 4 g lead, silver equal to 2.5 times the mass of gold and a small piece of copper (about 50 mg). The parting process is repeated and the final cornets are weighed.

The proof assays should contain approximately the same amount of palladium as the sample.

1.9.4 Gold Alloys Incorporating More Than 40% Silver

These alloys shall be treated as yellow gold alloys, with proper allowance being made for the higher silver content when determining the inquartation addition.

1.9.5 Alloys containing 999‰ gold

When analysing samples containing approximately 999‰ gold, still increased accuracy in operation and parameter control is needed.

In order to achieve the best results, proceed as stated in 1.9, introducting the following modifications.

i) Weight at least 250mg of alloy; add (20±5) mg of copper to the sample and an amount of inquartation silver as stated in 1.9.1(iii).

ii) For the proof assay samples, proceed exactly in the same way as for the assay samples; use gold of a purity of 999.99 (‰) and take care that the mass of the added inquartation silver lies in the same range (±10mg) as for the assay samples. Always run in parallel at least two proof assay samples.

iii) Carry out the cupellation with a total amount of at least 2g of lead. Note : the cupellation will take about 15 min.

iv) After cupellation, flatten all beads so that they have approximately the same shape and thickness, anneal the flattened beads in a muffle to red heat to obtain the same conditions of recrystallization.

v) Proceed to the parting of the smapling as stated in 1.9.1 (vi) Take care that the quantity of acid and the parting time are the same for all samples of the same series. Finally dry and anneal in parallel alll fine gold cornets. The use of a basket for the parting will be advantageous for this purpose.

1.10 Results Analysis

Calculate the gold content W_{Au}, in parts by mass per thousand (‰) of the alloy using the formula:

$$W_{Au} = \frac{M_2 + \Delta T}{M_1} \times 10^3$$

Where

M_1 is the mass, in milligrams, of the sample

M_2 is the mass, in milligrams, of the samples cornet

ΔT is the average value of the proof assay gold mass minus cornet mass of proof assay sample, in milligrams.

1.11 Records

Record the test raw data on data logbook WS-001

1.12 Repeatability

Duplicate determinations shall give results differing by less than 0.5 part by mass per thousand (‰) for yellow and red gold alloys and less than 1.0 part by mass per thousand (‰) for white gold alloys and less than 0.2 parts per thousand (‰) by mass for gold alloys containing 990 ‰ or more of gold. If the difference is greater than this, the assay shall be repeated.

? T of the proof samples run in parallel shall not differ by more than 0.1 mg.

When analysing alloys with a fine gold content of 990 ‰ or more, the values for ΔT of the proof samples run in parallel shall not differ by more than 0.04 mg. If the difference is greater than this, the assay shall be repeated.

1.13 Notes on Procedure

When the composition of the samples is unknown, use a preliminary assay for the estimation of the fineness of gold. For the distinction between palladium and nickel white golds, the touch stone test can also be used. If the cornet breaks up during the parting process, this is often an indication of excess silver.

The cupel should be examined carefully to ensure that the precious metal bead contains all the sample gold. Small droplet residues indicate the need for a repeat determination in a smaller cupel.

1.14 Calculations and data transfer

(i) All calculations which are based on original test data must be checked and counter signed by another laboratory technician.

(ii) Proforma worksheets with endorsed test results must be submitted along with the test report (for signature) to avoid incorrect transfer of data.

II Determination of Platinum in Platinum Jewellery Alloys ICP-Solution-Spectrometric Method Using Yttrium as Internal Standard Element ISO/DIS 11494: 1993(E)

2.1 Application and limitations

This methods is for the determination of platinum in platinum jewellery alloys.

This method is destructive in nature and requires skilful operators.

2.2 Date of Publication: 1993

2.3 Scope

This method describes a procedure for the determination of platinum jewellery platinum alloys preferably within the range of fineness as stated in ISO 9202 using inductively coupled plasma emission spectrometry.

Preferentially the platinum content of the alloys lies between 85% and 100% platinum.

Platinum jewellery alloys may contain iridium, palladium, gold, rhodium, copper, cobalt, ruthenium, gallium, chromium, indium and tungsten less than 5%. Interference with determination procedure by the presence of these alloying elements have not been observed.

2.4 Principle

An accurately weighed sample is dissolved in aqua regia and made up to an exactly weighed mass. An exactly weighed portion (aliquot) of this sample solution is mixed with a buffer and an internal standard and made up to the standard measuring volume.

Using a ICP-emission spectrometer the platinum content is measured by comparison of the ratio intensities of the spectral emission of platinum (at 265.95 n, or 214.42 nm) and yttrium (371.03 nm) with the ratios for solutions containing known masses of platinum and yttrium.

Minor modifications are required when the alloys contains ruthenium, rhodium, iridium, chromium or tungsten.

2.5 Reference Standard

The following method is based on the standard ISO/DIS 11494: 1993(E)

2.6 Equipment

i) ICP - (Inductively Coupled Plasma) emission spectrometer with the capability of simultaneously measuring the platinum emission line 265.95 nm, or 214.42 nm, and the emission line of the internal standard Y 371.03 nm. Certain performance specification must be achieved, see section 2.9 (iv)

Spectrometers with the following characteristic data have proved satisfactory:

Linear Reciprocal Dispesion:	0.5 nm /mm
Optical Resolution :	0.02 nm
High Frequency Operating Power :	1,200 Watt standard torch

The performance of the instrument is checked by aspirated 10 ppm into the instrument and the emission count should be 200,000 or above. If the count is lower than this value, service is required.

ii) Microbalance weighing to 0.001 mg

iii) Analytical balance weighting to 0.01 mg

2.7 Reagents

During the analysis, unless otherwise stated, use only reagents of recognized analytical grade and only distilled water or water of equivalent purity. All reagents shall be platinum free.

i) Hydrochloric acid, 32% HCl (m/m), ρ_{20}=1.16 g/cm^3.

ii) Nitric acid, 65% HNO_3 (m/m), ρ_{20}=1.41 g/cm^3.

iii) Pure Platinum; Independently certified
The platinum content shall be at least 99.99 %.

iv) Buffer Solution 1:
268.3 g $CuCl_2 \bullet 2H_2O$ are dissolved in 400 ml water and made up to 500 ml with water.

v) Buffer Solution 2:
73.0 g $NaNO_3$ and approximately 680 mg $YCl_3 \bullet 6H_2O$ are dissolved in 400 ml water and made up to 500 ml with water.

2.8 Sampling Procedure

The sampling procedure for jewellery platinum alloys shall be agreed upon until a corresponding standard method has been issued.

2.9 Procedure

i) Calibration Solution
Weigh approximately 50 mg platinum (2.7(iii)) accurately to at least 0.01 mg and

dissolve in hot 15 ml hydrochloric acid (2.7(i)) and 5 ml nitric acid (2.7(ii)) in a tared 50 ml volumetric flask. Add water until the mass of the solution is approximately 50 g accurately to at least 0.01 g. This Pt stock solution is used to prepare the calibration solutions.

Weigh approximately 4.125; 4.375; 4.625; 4.875 g accurately to at least 0.001 g of the Pt stock solution each into a 50 ml volumetric flask. Add 5 g accurately to 0.01 g buffer solution 1 (2.7(iv)) and 5 g accurately to 0.001 g buffer solution 2 (2.7(v)). Add 25 ml HCl (2.7(i)) and make up to 50 ml with water. Mix thoroughly.

ii) Sample Solution

Weigh approximately 50 mg sample accurately to at least 0.01 mg, dissolve and treat the sample as described in 2.9(i). Weigh approximately 5 g accurately to at least 0.001 g of this "sample stock solution" into a 50 ml volumetric flask, add 5 g accurately to 0.01 g buffer solution 1 (2.7(iv)) and 5 g accurately to 0.001 g buffer solution 2 (2.7(v)). Add 25 ml HCl (2.7(i)) and make up to 50 ml with water. Mix thoroughly.

Since the solution (2.7(v)) does not contain a well definite quantity of yttrium, every portion added to the calibration solutions and to the sample solution has to be taken from the same stock solution.

Note: Attention is drawn to the possibility that smaller samples will also be more affected by any variation on homogenity in the material sampled.

iii) a) Platinum alloys containing ruthenium, rhodium, iridium or tungsten

Platinum alloys containing more than 5% of the cited elements may require a pressure dissolution or involve a preliminary inquartation stage with an equal quantity of platinum free copper. The quantity of copper used will require modification of volume of buffer 1 (2.7(iv)) added.

b) Platinum alloys containg ruthenium, rhodium, iridium and

chromium

It is always useful to compare the analytical results obtained with the two Pt-lines (265.95 nm and 214.42 nm). In case of jewellery-alloys containing ruthenium, rhodium, and chromium interferences of the Pt-line 265.95 nm may occur, so the Pt-line 214.42 nm has to be used. If the alloy contain iridium more than 1%, a Pt-line free from interference (e.g 330.186) has to be used.

iv) Measurements

The data processing unit of the ICP spectrometer is used to establish a measuring program in which the intensities of the emission lines of Pt 265.95 (or 214.42) and of the internal standard element Y 371.03 nm can be measrued simultaneously. Allow the ICP torch at least 15 minutes after ignition to stabilize before use. Aspirate the calibration solutions and the sample solutions sequentially.

Each standard and sample solution shall have a 30 second preintegration period followed by 5 times 5 seond integration time. The rough value is determined according to 2.10 (1) to (6). The accurate mass of platinum of the sample solution results form the measurement of the 2 calibration solutions bracketing the rough value of the sample solution; see 2.10(7).

2.10 Results Analysis

Note: The method of internal standardization is based on the linear relation between the intensity ration I_{Pt}/I_y and the concentration ratios C_{Pt}/C_y or better mass ratios m_{Pt}/m_y . Using the same mass of yttrium (buffer /internal standard solution) to prepare all solutions, it is not necessary to have an exact volume of the measuring solutions. The accuracy of the 50 ml volumetric flask is satisfactory. The other important advantage of refering always on the same mass of the internal standard is that all calculations can be done with m_{Pt} instead of $m_{Pt}/m_{y,\ nominal}$.

Generally the data processing unit provides the quotients from the simultaneously registered

single measurements of the platinum and the yttrium intensities.

Approximate Determination

If the mean value of the 5 intensity quotients (Q) belonging to each solution is:

$$(1) \quad Q = \frac{1}{5}\left(\sum_{1}^{5} \frac{I_{Pt}}{I_Y}\right)$$

then this mean value must have a relative standard deviation (RSD) from Q not larger than 0.5 %.

(2) RSD of $Q_{N=5} \leq 0.5\%$

For the reason of deviations from the nominal weight m_{IS} of the buffer/internal standard solution (m_{IS} = 500 g) each intensity quotient belonging to a measuring solution must be corrected by the corresponding real weight of buffer solution $w_{IS,n}$ [g] used to prepared this measuring solution

$$(3) \quad Q^c = Q \bullet \frac{w_{IS,n}}{m_{IS}}$$

To determine the calibration curve using this corrected intensity quotients the exact masses of platinum in the calibration solutions $m_{Pt,CS,n}$ [mg] are required. These masses shall be calculated individually for each calibration solution respective calibration point as follows:

$$(4) \quad m_{pt,CS,n} = \frac{w_{Pt,SS}}{m_{SS,Pt}} \bullet w_{SS,Pt,n}$$

where

$w_{Pt,SS}$ = weight in mg of Platinum used to prepare the Pt-stocksolution.

$m_{SS,Pt}$ = mass in g of prepared the Pt-stocksolution

$w_{SS,Pt,n}$ = weight in g of Pt-stocksolution used to prepare thecalibration solution, n.

From the corrected intensity quotients Q^c and the corresponding massess of platinum $m_{Pt,CS,n}$ the calibration curve shall be determined according to the least squares method and shall be within the linear dynamic range of the instrument.

(5) $m_{pt} = A_0 + A_1 \bullet Q^c$ [mg]

By inserting the corrected mean value Q^c for the sample in equation (5) one obtains the rough value of the mass platinum, in mg of the s ample solution, m^1_{pt}

(6) $m^1_{pt} = A_0 + A_1 \bullet Q^c_s$

Sample Calculation

The two calibration points nearest to the rough value m^1_{Pt}; corresponding to a, for the low mass and b for the high mass; are used to determine the platinum mass in the sample solution according to (7):

(7) $$m_{pt} = \frac{(b-a) \bullet (Q^C_S - Q^C_b)}{(Q^C_b - Q^C_a)} + b \qquad [mg]$$

where

a = mass in mg of platinum in the calibration solution used as “low- standard” according to (4)

b = mass in mg of platinum in the calibration solution used as “high-standard” according to (4)

Q^C_a = corrected intensity ratio I_{Pt}/I_Y of the "low -standard"

Q^C_b = corrected intensity ratio I_{Pt}/I_Y of the "High -standard"

Q^C_S = corrected intensity ratio I_{Pt}/I_Y of the sample measuring solution

The final mass platinum $m_{Pt,fin}$ of the sample solution results fromt he mean value of five(5) measuring cycles and evaluations of this type.

$$m_{pt,fin} = \frac{1}{5}\left(\sum_{1}^{5} m_{Pt}\right)$$

The relative standard deviation RSD of this mean value shall not be larger than 0.5 %

After the mean value has been determined from the 5 single determinations of the sample solution the platinum content of the sample finally results according to:

$$(8) \qquad \%_0 Pt = \frac{m_{Pt,fin} \bullet m_{SS,Sa}}{w_{Sa} \bullet w_{SS,Sa}} \bullet 1000$$

w_{Sa} = weight in mg of sample used to prepare the sample stock solution.

$m_{SS,Sa}$ = mass in g of prepared the sample-stocksolution

$w_{SS,Sa}$ = weight in g of sample-stocksolution used to prepare the sample measuring solution

2.11 Records

Record the test raw data on data logbook WS-002

2.12 Repeatability

Duplicate determinations shall give results differing by less than 3 ‰ (parts per thousand) of platinum. If difference is greater than this, the assay shall be repeated.

2.13 Calculations and data transfer

(i) All calculations which are based on original test data must be checked and counter signed by another laboratory technician.

(ii) Proforma worksheets with endorsed test results must be submitted along with the test report (for signature) to avoid incorrect transfer of data.

Pro-forma Worksheet

Test Performed : Gold Fire Assay (WS-001)

Data of Standard

	Standard 1	Standard 2
Standard Mass Used (g)		
Standard Mass after Test (g)		
Mass Different		
? T Value of the proof assay		

Data of Sample (s)

Sample Description : _____

Type of Gold Sample : Red or yellow gold/ white gold / 990‰ or above

	Sample		Sample	
	Trail 1	Trail 2	Trail 1	Trail 2
The Mass of Sample, M_1(g)				
The Mass of Sample Cornet, M_2 (g)				
The Gold Content W_{Au} (‰)				
The average Gold Content W_{Au} (‰)				

Done by : _____Date : _____ Time : _____

Checked by : _____ Date : _____ Time : _____

Remarks : Repeatability requirement

Red/yellow gold : 0.5‰ White Gold : 1.0‰ ? T <0.1mg different

Greater than 990‰ : 0.2‰, ? T <0.04mg different

Data of Sample (s)

Sample Description : _____

Type of Gold Sample : Red or yellow gold/ white gold / 990‰ or above

	Sample		Sample	
	Trail 1	Trail 2	Trail 1	Trail 2
The Mass of Sample, M_1(g)				
The Mass of Sample Cornet, M_2 (g)				
The Gold Content W_{Au} (‰)				
The average Gold Content W_{Au} (‰)				

Sample Description : _____

Type of Gold Sample : Red or yellow gold/ white gold / 990‰ or above

	Sample		Sample	
	Trail 1	Trail 2	Trail 1	Trail 2
The Mass of Sample, M_1(g)				
The Mass of Sample Cornet, M_2 (g)				
The Gold Content W_{Au} (‰)				
The average Gold Content W_{Au} (‰)				

Done by : _____Date : _____ Time : _____

Checked by : _____ Date : _____ Time : _____

Remarks : Repeatability requirement

Red/yellow gold : 0.5‰ White Gold : 1.0‰ ? T <0.04mg different

Greater than 990‰ : 0.2‰, ? T <0.04mg different

Pro-forma Worksheet

Determination of Platinum in Platinum Jewellery Alloys (WS-002)

Sample Description : _____

Date of Receipt : _____

Standard:

	Standard			
	1	**2**	**3**	**4**
Weight of Platinum, $W_{Pt,SS}$ (mg)				
Mass of the prepared Platinum Solution, $m_{SS,Pt}$ (g)				
Weight of Platinum Stocksolution used, $w_{SS,Pt,n}$ (g)				
Weight of Buffer Solution 2, $w_{IS,n}$ (g)				

Sample:

	Trial 1	Trial 2
Weight of Sample, w_{Sa} (mg)		
Mass of the prepared Stock Solution, $m_{SS,Sa}$ (g)		
Weight of Sample Stocksolution used, $w_{SS,Sa}$ (g)		
Weight of Buffer Solution 2, w_{IS} (g)		
Platinum Content (‰)		
Average Platinum Content (‰)		

Remarks : Repeatability requirement: less than 3‰ for duplicate determinations.

APPENDIX G

Syndicate Group Discussion Worksheet

ISSUE: In view of the Project's short and long term goals to:

- Encourage increasing trade and investments
- Enhance consumer protection
- Ensure industry's sustained growth and development

Does it become necessary for the fine jewelry industry in the APEC member economies to adopt a standard in:

a) Testing method? ☐ Yes ☐ No

b) Testing and marking methods? ☐ Yes ☐ No

c) Testing and hallmarking? ☐ Yes ☐ No

PERSPECTIVES: Please state briefly the reason/s supporting your answers from the perspectives of the following:

a) Manufacturer:_____
_____
_____

b) Buyer/Wholesaler: _____
_____
_____
__

c) Retailer:_____
_____
_____

d) Inter-APEC trade: _____
_____
_____

TEST: In line with your responses to the foregoing, what would you recommend as the mandatory test procedure (or the final arbitration test) to be adopted within the region for the following metals:

a) Gold _____
b) Platinum _____
c) Silver _____

SAFEGUARDS: To guarantee compliance with the mandatory test procedures you recommend, what safeguard modalities do you think should be installed for tests done by:

Purely Government-run Assay Office: _____
_____
_____
_

Government-Supervised/Accredited Assay Office: _____
_____
_____
_

Industry/Privately-Operated Assay Office: _____
_____
_____
__

AGENDA FOR ACTION: To bring the Region to the full adoption of the standard you have recommended under ISSUE, what agenda for action (interventions) would you recommend in each of the following areas:

- Information Dissemination/Advocacy
- Training
- Policy Recommendation

  - APEC level
  - Member economy level
  - Associations
  - Company

- Others

APPENDIX H

Pictorials

The project team with Mr. Pichait Palanugool, Vice President 3, Thai Gem and Jewellery Traders Association.

With representatives from the Ministry of International Trade and Industry, Bureau of Domestic Trade and SIRIM.

APPENDIX H

Pictorials

The project team with Mr. Pichait Palanugool, Vice President 3, Thai Gem and Jewellery Traders Association.

With representatives from the Ministry of International Trade and Industry, Bureau of Domestic Trade and SIRIM.

With Mr. Johnny Salmon, President of the Indonesia Goldsmith and Jewelers Association

Engr. Franklin P. Bunoan, Contractor, CITC San Eligius Jewellery Training Center presented an overview of assaying and hallmarking practices in APEC economies during the seminar-workshop in Hong Kong

Dr. Lo Wai Yin, Consultant, Chemistry and Metallurgy Division of the Hong Kong Productivity Center giving lecture on ISO 11426 and ISO 11494.

A plaque of appreciation was presented to Ms. Gillian Ho, Manager of the Singapore Assay Office for her presentation on the jewelry assaying and hallmarking and trade in Singapore given by Ms. Gia Marie Andres, Project Overseer.

The Manager of the Hong Kong Productivity Center giving a certificate of participation to one of the participants during the closing ceremonies.

Group picture of training-workshop participants and organizers.