

**PUBLIC RECORD**

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27 July 2015

**BY E-MAIL**

**Director, Operations 2  
Anti-Dumping Commission  
GPO Box 9839  
Canberra City ACT 2601  
Australia**

Re: Anti-Circumvention Inquiry on Zinc Coated (Galvanized) Steel Exported from the People's Republic of China, the Republic of Korea and Taiwan (No. 290 and 298)

Dear Sir or Madam:

On behalf of Yieh Phui Enterprise Co., Ltd. ("Yieh Phui") and its related trading company Asiazone Co., Limited ("Asiazone"), we hereby submit the exporter questionnaire response for the above-captioned proceeding.

Please let us know if you have any questions regarding this submission. In the future correspondences please communicate to the following personnel of Appleton Luff: Jay Nee ([nee@appletonluff.com](mailto:nee@appletonluff.com)) and Isaac Lin ([lin@appletonluff.com](mailto:lin@appletonluff.com)) in the above-referenced proceeding.

Very truly yours,



Jay Y. Nee

Appleton Luff is a specialty law firm focusing on issues of international trade, cross-border commerce, arbitration, investment and public international law. The firm operates as separately incorporated law offices located in Brussels, Geneva, Singapore, Warsaw and Washington, D.C.



## ANTI-CIRCUMVENTION INQUIRIES

### NUMBER 290 AND 298

EXPORTS OF SLIGHTLY MODIFIED GOODS TO AUSTRALIA

ZINC COATED (GALVANISED) STEEL EXPORTED FROM THE PEOPLE'S  
REPUBLIC OF CHINA, THE REPUBLIC OF KOREA AND TAIWAN

### EXPORTER QUESTIONNAIRE

Periods of inquiry: KOREA AND TAIWAN  
1 JULY 2011 – 31 MARCH 2015

CHINA  
1 JULY 2011 TO 31 MAY 2015

Response due by: **27 July 2015**

#### CASE CONTACT

Case Manager: MR ROMAN MAEVSKY  
Phone: +61 3 8539 2400  
E-mail: [operations2@adcommission.gov.au](mailto:operations2@adcommission.gov.au)  
Anti-Dumping  
Commission website: [www.adcommission.gov.au](http://www.adcommission.gov.au)

#### RETURN OF QUESTIONNAIRE

By email: [operations2@adcommission.gov.au](mailto:operations2@adcommission.gov.au)

By mail  
(on CD-ROM or USB): Attn: Director, Operations 2  
Anti-Dumping Commission  
GPO BOX 9839  
CANBERRA CITY ACT 2601

## 1. BACKGROUND

### 1.1. Original investigation and measures

On 5 August 2013, following consideration of *Anti-Dumping Commission Report No. 190*, the then Attorney-General published a dumping duty notice and a countervailing duty notice imposing anti-dumping measures in the form of interim dumping duty (IDD) and interim countervailing duty (ICD) on zinc coated steel of iron or non-alloy steel (galvanised steel) exported to Australia from the People's Republic of China (China), the Republic of Korea (Korea) and Taiwan.

The dumping duty notice covers all exporters of galvanised steel from the China, Korea and Taiwan except for Union Steel Co., Ltd (Union Steel Korea) from Korea; Sheng Yu Co., Ltd (Sheng Yu) from Taiwan; and Ta Fong Steel Co., Ltd (Ta Fong) from Taiwan.

The countervailing duty notice covers all exporters of galvanised steel from China except for Angang Steel Company Limited (ANSTEEL) and ANSC TKS Galvanising Co., Ltd (TAGAL).

### 1.2. Background to anti-circumvention inquiries

#### 1.2.1. Investigation 290

On 1 April 2015, BlueScope Steel Limited (BlueScope), the sole Australian producer of galvanised steel, lodged an application under s.269ZDBC(1) of the *Customs Act 1901* (the Act)<sup>1</sup> for an anti-circumvention inquiry in relation to galvanised steel exported from Korea and Taiwan.

In its application, BlueScope alleged that the applicable anti-dumping measures in respect of galvanised steel from Korea and Taiwan were being circumvented by importers and exporters of the goods through the slight modification of those goods. Specifically, BlueScope alleged that galvanised steel that would otherwise be subject to the anti-dumping measures, was being slightly modified through the addition of alloys to those goods, which allows for those goods to no longer be considered galvanised steel of **iron or non-alloy** steel, but rather of alloyed steel.

In its application, BlueScope highlighted that it considers galvanised steel including the alloying element of boron has been imported and circumvented the anti-dumping measures. BlueScope identified that other alloys (such as chromium) may also have been used in such a modification.

Following consideration of this application, the Commissioner of the Anti-Dumping Commission (the Commissioner) decided to not reject the application, and an anti-

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<sup>1</sup> All legislative references in this document refer to provisions of the Act unless specifically stated otherwise.

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circumvention inquiry into the slight modification of galvanised steel exported from Korea and Taiwan was initiated on 5 May 2015.

Details of the Commissioner's consideration of this application are in *Consideration Report 290*.

### **1.2.2. Investigation 298**

On 7 May 2015, BlueScope lodged an application under s.269ZDBC(1) for an anti-circumvention inquiry in relation to galvanised steel exported from China.

As with the application lodged in relation to Korea and Taiwan, BlueScope alleged the circumvention of anti-dumping measures through the slight modification (alloy-adding) of galvanised steel exported from China.

Following consideration of this second application, the Commissioner decided to not reject the application, and an anti-circumvention inquiry into the slight modification of galvanised steel exported from China was initiated on 1 June 2015.

Details of the Commissioner's consideration of this application are in *Consideration Report 298*.

### **1.2.3. Inquiry process**

The anti-circumvention inquiries will examine whether any exporters of galvanised steel from China, Korea or Taiwan have engaged in a circumvention activity where there is a slight modification of goods exported to Australia, as outlined in subsection 48(2) of the *Customs (International Obligations) Regulation 2015*.

The alleged circumvention goods exported to Australia during the period 1 July 2011 to 31 March 2015 will be examined to determine whether the circumvention activity has occurred in relation to goods exported from Korea and Taiwan.

The alleged circumvention goods exported to Australia from China during the period 1 July 2011 to 31 May 2015 will be examined to determine whether the circumvention activity has occurred.

Unless the inquiry is terminated earlier, after concluding the inquiry, the Commissioner will provide a report and recommendations to the Parliamentary Secretary to the Minister for Industry and Science (the Parliamentary Secretary).

This report will recommend to the Parliamentary Secretary that, pursuant to subsection 269ZDBG(1) of the Act, the original dumping duty notice and countervailing duty notice in respect of galvanised steel:

- remain unaltered; or
- be altered following a finding that circumvention activity in relation to the original notice/s has occurred; and
- the alterations to be made

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After considering the report and any other information that the Parliamentary Secretary considers relevant, the Parliamentary Secretary may leave the original notice unaltered or alter the original notice, specifying different goods that are subject to the notice, and/or altering variable factors in respect of certain exporters subject to the notice.

The Commission's inquiry will be carried out under the provisions of the Part XVB of the Act.

## 2. THE GOODS AND THE CIRCUMVENTION GOODS

### 2.1. The goods subject to anti-dumping measures (the goods)

The goods subject to the dumping duty notice and the countervailing duty notice (the goods) are described as:

*Flat rolled products of **iron and non-alloy steel** of a width less than 600mm and, equal to or greater than 600mm, plated or coated with zinc.*

For the purposes of this questionnaire, the goods will be referred to as '**non-alloy galvanised steel**' or as '**the goods**'.

#### 2.1.1. Additional product information

Further to the above description of the goods, the following additional information may assist in identifying the goods:

*Galvanised steel of any width is included.*

*The amount of zinc coating on the steel is described as its coating mass and is nominated in grams per meter squared (g/m<sup>2</sup>) with the prefix being Z (Zinc) or ZF (Zinc converted to a Zinc/Iron alloy coating). Common coating masses used for zinc coating are: Z350, Z275, Z200, Z100, and for zinc/iron alloy coating are: ZF100, ZF80 and ZF30 or equivalents based on international standards and naming conventions.*

*Trade or further generic names often used to describe the goods the subject of the application include:*

- "GALVABOND®" steel
- "ZINCFORM®" steel
- "GALVASPAN®" steel
- "ZINCHITEN®" steel
- "ZINCANNEAL" steel
- "ZINCSEAL" steel
- Galv
- GI
- Hot Dip Zinc coated steel
- Hot Dip Zinc/Iron alloy coated steel
- Galvanneal

*The amount of zinc coating on the steel is described as its coating mass and is nominated in grams per meter squared (g/m<sup>2</sup>) with the prefix being Z (Zinc) or ZF (Zinc converted to a Zinc/Iron alloy coating). The common coating masses used for zinc coating are: Z350, Z275, Z200/Z180, Z100, and for zinc/iron alloy coatings are ZF100, ZF80 and ZF30 or equivalents based on international standards and naming conventions.*

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*Surface treatments can include but not be limited to; passivated or not passivated (often referred to as chromated or unchromated), oiled or not oiled, skin passed or not skin passed, phosphated or not phosphated (for zinc iron alloy coated steel only).*

*There are a number of relevant International Standards for zinc coated products that cover their own range of products via specific grade designations, including the recommended or guaranteed properties of each of these product grades.*

*These relevant standards are noted below in Table A-3.1 "Relevant International Standards for zinc coated steel".*

### 2.1.2. Tariff classifications of the goods

The goods are classified to tariff subheadings:

- 7210.49.00 (statistical codes 55, 56, 57 and 58); and
- 7212.30.00 (statistical code 61)

of Schedule 3 to the *Customs Tariff Act 1995* (Tariff Act).

The general rate of duty is 5% for goods imported under these tariff subheadings. Imports from China are subject to the DCS duty rate which is free. Imports from Korea are subject to the DCT duty rate which is 3% per the Korea-Australia Free Trade Agreement (KAFTA) and Taiwan are subject to the DCT duty rate which is 5%.

### 2.2. The goods subject to the inquiries (the circumvention goods)

The goods subject to the anti-circumvention inquiries (the circumvention goods) are described as:

*Flat rolled iron or steel products (**whether or not containing alloys**) of a width less than 600mm and, equal to or greater than 600mm, plated or coated with zinc.*

For the purposes of this questionnaire, the circumvention goods are referred to as 'alloyed galvanised steel' or as 'the circumvention goods'.

***IMPORTANT:*** the circumvention goods are galvanised steel that includes any alloy(s) and not only galvanised steel that contains boron. Please answer questions in this questionnaire in relation to the circumvention goods regarding any type of alloyed galvanised steel manufactured and/or sold by your company.

#### 2.2.1. Tariff classifications of the circumvention goods

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The alloyed galvanised steel is classified to tariff subheadings:

- 7225.92.00 (statistical code 38); and
- 7226.99.00 (statistical code 71)

of Schedule 3 to the Tariff Act.

The general rate of duty is 5% for goods imported under these tariff subheadings. Imports from China are subject to the DCS duty rate which is free. Imports from Korea are subject to the DCT duty rate which is 3% per the KAFTA and Taiwan are subject to the DCT duty rate which is 5%.

### **2.3. Identifying and classifying the goods and the circumvention goods**

The notes to Chapter 72 (iron and steel) of Schedule 3 of the Tariff Act provide that, in order for a product to be considered of 'other alloy' steel (required to be classified to the above codes relating to alloyed galvanised steel), the below must be satisfied:

*Steels not complying with the definition of stainless steel and containing by weight one or more of the following elements in the proportion shown:*

- *0.3% or more of aluminium*
- *0.0008% or more of boron*
- *0.3% or more of chromium*
- *0.3% or more of cobalt*
- *0.4% or more of copper*
- *0.4% or more of lead*
- *1.65% or more of manganese*
- *0.08% or more of molybdenum*
- *0.3% or more of nickel*
- *0.06% or more of niobium*
- *0.6% or more of silicon*
- *0.05% or more of titanium*
- *0.3% or more of tungsten (wolfram)*
- *0.1% or more of vanadium*
- *0.05% or more of zirconium*
- *0.1% or more of other elements (except sulphur, phosphorus, carbon and nitrogen), taken separately.*

Galvanised steel that does not meet these requirements should be classified to 7210.49.00 (statistical codes 55, 56, 57 and 58) and 7212.30.00 (statistical code 61) and are considered to be non-alloy galvanised steel.

### 3. INSTRUCTIONS

#### 3.1. Why you have been asked to fill out this questionnaire?

The Commission is responsible for conducting the inquiries into alleged circumvention activities to determine whether those activities have occurred.

The Commission has identified your company as a possible exporter alloyed galvanised steel, and will examine your exports during the inquiry periods to determine whether circumvention of the measures has occurred.

#### 3.2. What happens if you do not respond to this questionnaire?

You do not have to complete the questionnaire. However, if you do not respond, do not provide all of the information sought, do not provide information within a reasonable time period, or do not allow the Commission to verify the information if deemed necessary, the Commission may be required to rely on information supplied by other parties (possibly information supplied by the Australian industry) to assess if circumvention of the measures has occurred.

It is in your interest, therefore, to provide a complete and accurate submission, capable of verification.

#### 3.3. Due date for response

You are requested to respond to this questionnaire and return it to the Commission within the time specified on the cover page. There is a statutory time limit imposed for the inquiries. The Commission may not be able to consider submissions received after the due date.

If you cannot lodge your submission by the due date please advise the inquiries' case manager as soon as possible.

#### 3.4. Confidential and non-confidential submissions

You are required to lodge one confidential version (for official use only) and one non-confidential version (for public record) of your response by the due date.

Please ensure that each page of information you provide is clearly marked either "FOR OFFICIAL USE ONLY" or "PUBLIC RECORD".

All information provided to the Commission in confidence will be treated accordingly. The non-confidential version of your submission will be placed on the public record.

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Please note, Australia's anti-dumping and countervailing legislation requires that to the extent that information given to the Commission is claimed to be confidential or whose publication would adversely affect a business or commercial interest, the person giving the information must ensure that a summary of that information contains sufficient detail to allow a reasonable understanding of the substance of the information, but does not breach confidentiality nor adversely affect those interests.

The legislation allows that a person is not required to provide a summary for the public record if the Commission can be satisfied that no such summary can be given that would allow a reasonable understanding of the substance of the information. However, such a summary would add considerably to an interested party's understanding of information contained in a document.

As provided for in Australia's anti-dumping and countervailing legislation, all submissions are required to have a bracketed explanation of deleted or blacked out information for the non-confidential version of the submission. Note that if such an explanation is not provided, the Commission may disregard the information in the submission. An example of a statement to accompany deleted/blacked out text is:

[explanation of cost allocation through the divisions].

If, for some reason, you cannot produce a non-confidential summary, please contact the inquiries' case manager.

Further advice on providing non-confidential information to the Commission can be found in Australian Customs Dumping Notice (ACDN) 2012/42, available on the Commission's website.

### **3.5. Exporter's declaration**

Chapter 6 requires you to make a declaration that the information contained in your submission is complete and correct. Alternatively, if you did not export the circumvention goods during the period of inquiry, you may make a declaration to that effect.

You must return a signed declaration with your response to the questionnaire.

### **3.6. Verification of the information that you supply**

The Commission may seek to verify the information provided in your submission.

This verification may take the form of written requests for additional information or an in-person verification visit with your company at its premises.

The purpose of verification is to authenticate the information submitted in response to this questionnaire. It is not meant to be a chance for you to provide new or additional information. The Commission expects your response to the questionnaire to be complete and accurate.

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If an in-person visit is considered necessary, during that visit we will want to examine in detail your company's records in respect of the goods and the circumvention goods and the goods and will ask for copies of documents relating to the manufacture and sale of those goods. We will need to consult with your staff, particularly your export sales people. We may also need to see your factory, in which case we will need to consult with your operational managers.

After gathering the information we will prepare a report of the visit. We will provide you with a draft of the report and then respond to any questions you have. We will ask you to prepare a non-confidential copy of the report for the public record.

### **3.7. If you do not manufacture the circumvention goods**

You may supply but not produce or manufacture the circumvention goods (for example, you are a trading company, broker, or vendor dealing in the circumvention goods).

In such cases it is important that you forward a copy of this questionnaire to the relevant manufacturers **immediately**. You should also inform the inquiries' case officer of the contact details for these manufacturers.

You should also **complete those sections of the questionnaire that you are reasonably able to complete**. If, for example, you are unable to supply details of production costs, you should clearly explain why the section does not apply to your company.

### **3.8. Some general instructions for preparing your response**

- When answering the questionnaire please carefully read all instructions. The Commission requires a response to *all* sections of this questionnaire. Please provide an explanation if a question is not relevant to your situation.
- Please ensure that information submitted conforms to the requested format and is clearly labelled. Please repeat the question to which you are responding and place your answer below it.
- Identify source documents and advise where they are kept. During on-site verification you should be prepared to substantiate all the information you have submitted. Every part of the response should be traceable to company documents that are used in the ordinary course of business.
- We recommend that you retain all work sheets used in answering the questionnaire, in particular those linking the information supplied with management and accounting records. This will help us to verify the information.

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- Where applicable, clearly identify all units of measurement and currencies used. Apply the same measurement consistently throughout your response to the questionnaire.

### 3.9. Provision of electronic data

- It is important that information is submitted in electronic format where directed.
- Electronic data should be emailed, or submitted on a CD-ROM or USB.
- The data must be created as spreadsheet files, preferably in Microsoft Excel, or alternatively in an Excel compatible format (for example, Excel can normally access data in Dbase or as an ASCII file). Excel files must be compatible to the USA version.
- An Excel workbook, ***Exporter Questionnaire – galvanised steel AC*** accompanies this questionnaire and forms a template for your response to the data requested. The workbook is referred to throughout this questionnaire as appropriate. This workbook should be completed and used to provide the requested data where possible.
- If you cannot present electronic data in the requested format contact the investigation case officer as soon as possible.

### 3.10. Further information

Before you respond to the questionnaire you should read the key documents available on the Commission's website and public record in relation to these inquiries ([www.adcommission.gov.au](http://www.adcommission.gov.au)) including:

- BlueScope's applications for the inquiries;
- Consideration Reports 290 and 298; and
- the Anti-Dumping notices notifying of the inquiries.

If you require further assistance, or you are having difficulties completing your submission, please contact the inquiries' case manager.

## 4. QUESTIONS FOR COMPLETION

This questionnaire response is being submitted for Yieh Phui Enterprise Co., Ltd. ("Yieh Phui") and its related trading company in Hong Kong, Asiazone Co., Limited ("Asiazone"). Yieh Phui is a Taiwanese producer of the goods subject to the anti-circumvention inquiry of galvanized steel from Taiwan. During the inquiry period (i.e., 1 July 2011 through 31 March 2015), Yieh Phui exported almost all of its alloyed galvanized steel to Australia through Asiazone. As Yieh Phui and Asiazone are related companies, this submission has been prepared by consolidating information from both companies. Where necessary, the information may be provided separately (e.g., sales data) so that it can be traced back to each company's records.

In addition, all of the alloyed galvanized steel that Yieh Phui exported to Australia and other markets during the inquiry period was boron-added steel. For the purpose of this submission, the reference of alloyed galvanized steel that Yieh Phui exported to Australia and other markets hereinafter refers to boron-added steel.

### 4.1. Identity and communication

#### 4.1.1. Company contact

Please nominate a person within your company who can be contacted for the purposes of this inquiry:

Head Office:

Name:  
Position in the company:  
Address:  
Telephone:  
Facsimile number:  
E-mail address of contact person:

Factory:

Address:  
Telephone:  
Facsimile number:  
E-mail address of contact person:

**ANSWER:** Please see below for the requested information of Yieh Phui and Asiazone:

**Yieh Phui**

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Yieh Phui's head office and factory are at the same premises. Thus, Yieh Phui has nominated the same contact person for the purpose of this inquiry:

Name: Steve Ling  
Position in the company: Sales Manager  
Address: 369 Yu Liao Road, Chiao Tou Hsiang,  
Kaohsiung, Taiwan, 82544  
Telephone: +886-7-6117181 (7437)  
Facsimile number: +886-7-6112397  
E-mail address of contact person: 9506@yiehphui.com.tw

### Asiazone

Asiazone is a trading company registered and operated in Hong Kong and it does not own or operate any factory for galvanized steel. The contact information of Asiazone is as follows:

Name: Mr. Louis Huang  
Position in the company: Manager  
Address: 20<sup>th</sup> floor, Tesbury Center, 28 Queen's road  
east, Hong Kong  
Telephone: +852-22198988  
Facsimile number: +852-22198788  
E-mail address of contact person: Louis@asiazone.com.hk

#### 4.1.2. Representative of the company for the purpose of inquiry

If you wish to appoint a representative to assist you in this inquiry, provide the following details:

Name:  
Address:  
Telephone:  
Facsimile/Telex number:  
E-mail address of contact person:

*Note that in nominating a representative, the Commission will assume that confidential material relating to your company in this inquiry may be freely released to, or discussed with, that representative.*

**ANSWER:** Please see the following for the contact information of Yieh Phui and Asiazone's representative:

Name: Jay Y. Nee  
Organisation: Appleton Luff Pte Ltd  
Position: Partner

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Address: One Raffles Quay, Level 25, North Tower, Singapore  
048583  
Telephone: +65-69339545  
Facsimile/Telex number: +65-6725-0803  
E-mail address: [nee@appletonluff.com](mailto:nee@appletonluff.com)

### 4.1.3. Company information

- a) What is the legal name of your business? What kind of entity is it (e.g. company, partnership, sole trader)? Please provide details of any other business names that you use to export and/or sell goods.

**ANSWER:** Yieh Phui's legal name is Yieh Phui Enterprise Co., Ltd. Yieh Phui is a publicly traded company listed on Taiwan Stock Exchange, incorporated under Taiwan's Company Law in August 1986. Yieh Phui does not use any other name to export and/or sell goods.

Asiazone's legal name is Asiazone Co., Limited. Asiazone is a trading company incorporated in Hong Kong and it does not use any other name to buy and/or sell goods.

- b) Provide a diagram showing all associated or affiliated companies and your company's place within that corporate structure.

**ANSWER:** Yieh Phui is a publicly traded company listed on Taiwan Stock Exchange, and has more than seventeen thousands of shareholders. As of April 2015, Yieh Phui's top ten largest shareholders are as follows:

| -  | <u>Name</u>                                    | <u>Percentage of Shares</u> |
|----|--|-----------------------------|
| 1  | Yieh United Steel Corporation                  | 15.79%                      |
| 2  | Wei Chiao Investment & Development Co., Ltd.   | 10.75%                      |
| 3  | United Brightening Development Corp            | 4.06%                       |
| 4  | Koa Chiao Investment & Development Co., Ltd.   | 3.23%                       |
| 5  | Wei Hung Investment & Development Co., Ltd.    | 2.76%                       |
| 6  | Hsing Loong Investment & Development Co., Ltd. | 2.50%                       |
| 7  | Lien Shuo Investment & Development Co., Ltd.   | 2.35%                       |
| 8  | Chi Yi Investment & Development Co., Ltd       | 2.21%                       |
| 9  | Yiao Phui Investment & Development Co., Ltd    | 2.18%                       |
| 10 | E-Da Hospital                                  | 2.08%                       |



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**ANSWER:** Yieh Phui performs all of the above-mentioned functions in relation to the alloyed galvanized steel.

### 4.2. Exports to Australia

#### 4.2.1. Description

Fully describe all non-alloy galvanized steel and alloyed galvanized steel you have exported to Australia during the inquiry period.

Include details of all models of the non-alloy galvanized steel and alloyed galvanized steel exported.

Include specification details, details of alloys and their levels, and include any technical and illustrative material that may be helpful in identifying, or classifying, the exported products.

**ANSWER:** Both of the non-alloy galvanized steel and alloyed galvanized steel that Yieh Phui exported to Australia during the inquiry period were manufactured pursuant to either the Australian Standard (“AS”) or the Japanese Industrial Standards (“JIS”). Please see Exhibit 3 and Exhibit 4 for a copy of the AS and JIS standards associated with the galvanized steel, i.e., “AS 1397” and “JIS G 3302”. Please also see Exhibit 5 for a list showing the models of non-alloy galvanized steel and alloyed galvanized steel sold by Yieh Phui to Australia during the inquiry period. In indicating the models of goods, Yieh Phui has taken into consideration the product characteristics including the standard, specification, coating mass, thickness (BMT basis), and width.

#### 4.2.2. Customer identity

For each customer in Australia to whom you shipped non-alloy galvanized steel and/or alloyed galvanized steel in the inquiry period list:

- name;
- address;
- contact name and phone/fax number where known;
- trade level (for example: distributor, wholesaler, retailer, end user, original equipment);
- whether you supplied them non-alloy galvanized steel, alloyed galvanized steel, or both.

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**ANSWER:** Please see below for an explanation of Yieh Phui's channels of sales of non-alloy and alloyed galvanized steel shipped by Yieh Phui to Australia during the inquiry period, and Exhibit 6 for the requested information with regard to Yieh Phui's customers in Australia:

Non-alloy galvanized steel

During the inquiry period, Yieh Phui had [REDACTED] for its sales of non-alloy galvanized steel to Australia. [REDACTED]

For [REDACTED], Yieh Phui [REDACTED], and during the inquiry period, all of Yieh Phui's sales of non-alloy galvanized steel to [REDACTED] were all [REDACTED].

For sales made through this channel, Yieh Phui negotiated the sales terms directly with [REDACTED]. For the purpose of [REDACTED], however, Yieh Phui [REDACTED]. The terms of sales negotiated and agreed upon between Yieh Phui and [REDACTED] were reflected on the [REDACTED] sales documentation.

For [REDACTED], Yieh Phui exported the non-alloy galvanized steel to Australia [REDACTED]. [REDACTED] Yieh Phui is aware of the identity of the end customer in Australia for sales made through this channel.

Alloyed galvanized steel

During the inquiry period, Yieh Phui had [REDACTED] of sales of alloyed galvanized steel to Australia, and all of these sales were made to [REDACTED] through [REDACTED]. The sales process for Yieh Phui's sales of alloyed galvanized steel to Australia is exactly the same as the one of Yieh Phui's sales of non-alloy galvanized steel to [REDACTED] as described above.

**4.2.3. Australian sales data**

Fill in the spreadsheet titled 'Australian sales' in the attached Excel workbook **Exporter Questionnaire – galvanized steel AC** in relation to your Australian sales of non-alloy galvanized steel and alloyed galvanized steel during the applicable inquiry period.

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If your company supplies non-alloy galvanised steel and/or alloyed galvanised steel from more than one or either:

- China;
- Korea; or
- Taiwan

please complete separate 'Australian sales' spreadsheets for each country.

See the cover of this questionnaire for the inquiry period applicable to your exports.

**ANSWER:** Please see Exhibit 7 for a spreadsheet in Excel showing all of Yieh Phui's sales of non-alloy galvanized steel and alloyed galvanized steel shipped to Australia during the inquiry period. As demonstrated in Exhibit 7, Yieh Phui had [REDACTED] of sales to Australia, [REDACTED]. For those sales through Asiazone, Yieh Phui has added in columns to show the corresponding information of Asiazone's resales including invoice numbers, invoice dates and selling prices.

#### 4.2.4. Australian sales documents

From the 'Australian sales' spreadsheet completed in response to Question 4.2.3, select:

- two shipments of the alloyed galvanised steel; and
- two shipments of non-alloy galvanised steel

in different quarters of the inquiry period.

If your company only exported alloyed galvanised steel during the inquiry period, please select four shipments of those goods.

Provide the following documentation related to those sales:

- a copy of your market offer for that sale;
- any correspondence negotiating terms of the sales, price, products, etc. that you have on record;
- the importer's purchase order, order confirmation, and contract of sale;
- commercial invoice;
- bill of lading, export permit;

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- packing list; and
- mill test certificate.

The Commission may select additional shipments for verification or provision of documentation at a later date.

**ANSWER:** Please see Exhibit 8 for the requested information.

### 4.2.5. Sales process

- a) Fully describe the sales process to your Australian customers of alloyed galvanised steel from market offer through to invoicing, delivery and payment.

In your response, indicate the time period for each of the sales process steps.

If there are multiple distribution channels alloyed galvanised steel, explain each separately.

**ANSWER:** The sales process for Yieh Phui's sales of alloyed typically started when [REDACTED] solicited price quotations from Yieh Phui via telephone or email. On behalf of [REDACTED], Yieh Phui then responded with quotations based on market conditions and its available production capacity. Both parties then negotiated the terms of sales. After the terms were resolved, Yieh Phui then [REDACTED]

[REDACTED]. Yieh Phui in the meantime also prepared its own sales contract for its sales to [REDACTED]. The [REDACTED] sales contract mirrors the terms of sale negotiated and agreed upon between Yieh Phui and [REDACTED]. On the other hand, the [REDACTED] sales contract also mirrors the terms stated in the [REDACTED] sales contract, except that the selling price from Yieh Phui to [REDACTED].

Once receiving the counter-signed sales contract from [REDACTED], [REDACTED] then in turn signed off the sales contract between itself and Yieh Phui. Upon the signed sales contract was received by Yieh Phui from [REDACTED], an internal order memorandum was then prepared by Yieh Phui's sales department for its production department. Production then began pursuant to the schedule planned by the production department.

After production, the merchandise was shipped directly from Taiwan to Australia. The commercial invoice and packing list were issued by Yieh Phui to [REDACTED] at or about the time of shipment. [REDACTED]. The delivery term of Yieh Phui's sales to [REDACTED] and [REDACTED] was identical in all Yieh Phui's exports

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of non-alloy galvanized steel to Australia during the inquiry period, and was on a [REDACTED] basis for all exports.

The term of payment for Yieh Phui's export sales to Australia during the inquiry period were based on Yieh Phui's standard payment term (i.e., either "[REDACTED]" or "[REDACTED]").

- b) Does the process described above differ in any way from the sales process of non-alloy galvanized steel? Provide details.

**ANSWER:** As explained in the answer to question 4.2.2 above, Yieh Phui had [REDACTED] for its sales of non-alloy galvanized steel to Australia.

[REDACTED]. For [REDACTED], Yieh Phui's sales of non-alloy galvanized steel to Australia involved Yieh Phui itself, [REDACTED]. For [REDACTED], Yieh Phui's sales of non-alloy galvanized steel to Australia involved Yieh Phui itself and the [REDACTED].

The sales process of Yieh Phui's non-alloy galvanized steel to Australia is the same as the one for Yieh Phui's sales of alloyed galvanized steel to Australia, except that there was no [REDACTED]'s involvement under [REDACTED] of the non-alloy galvanized steel (i.e., sales through [REDACTED]).

- c) Are the models of alloyed galvanized steel that you exported to Australia during the inquiry period part of your standard product offering to Australia, or are they only available under special circumstances (e.g. through special order)? Provide details.

**ANSWER:** During the inquiry period, the alloyed galvanized steel that Yieh Phui exported to Australia covered all models, except for those of [REDACTED].

- d) Do your Australian customers for alloyed galvanized steel specifically request/order the goods to include alloys that result in it being considered alloyed galvanized steel? Provide details.

**ANSWER:** No, the Australian customer for alloyed galvanized steel did not specifically request or order the goods to include alloys. However, the alloy being added in the galvanized steel exported to Australia resulted from the need of the Australian customer to minimize the strain aging effect of the goods.

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The strain ageing is a phenomenon known as the later reappearance of strength of steel at a higher level over a certain period of time after the production of steel is completed. The reappearance of a higher level of strength results in a loss of some ductility and formability of steel. Therefore, the finished goods which have been stored in the warehouse by the downstream customer for a longer time period is usually harder to be processed.

In order to resolve this issue, Yieh Phui offered boron-added galvanized steel to its Australian customer, as according to Yieh Phui's past experiences, adding a certain amount of boron would minimize the strain ageing effect of steel.

- e) Do you market alloyed galvanised steel differently from non-alloy galvanised steel. If so, describe any differences.

**ANSWER:** No, Yieh Phui did not market alloyed galvanized steel differently from non-alloy galvanized steel. However, Yieh Phui did inform its Australian customer the benefit of boron-added galvanized steel in minimizing the strain ageing effect.

- f) What is the minimum order quantity for export to Australia of:

- non-alloy galvanised steel;
- alloyed galvanised steel.

**ANSWER:** The minimum order quantity for export to Australia is [ ] metric tons for both non-alloy galvanized steel and alloyed galvanized steel.

### 4.2.6. Selling price

- a) Is there a difference in selling price to your Australian customers between non-alloy galvanised steel and alloyed galvanised steel, assuming all other factors of the sale were the same (e.g. customer, order quantity, product characteristics such as steel grade, coating mass, thickness, credit terms). Provide details.

I.e. are alloyed galvanised steel generally a different price to the goods based solely on the fact that they are an alloyed product?

**ANSWER:** During the inquiry period, Yieh Phui had a policy to charge an extra of [ ] USD/MT to the price for galvanized steel exported to Australia if boron is added. Therefore, there should be a price difference of [ ] USD/MT between non-alloy galvanized steel and boron-added galvanized steel, assuming all other factors of the sale were the same (e.g., timing, customer, order quantity, product characteristics and duties, etc.).

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- b) If the answer to the above is yes, quantify the price difference for each year of the inquiry period. Provide any documents that support this price difference (e.g. price lists, comparable invoices, etc).

**ANSWER:** As stated above, Yieh Phui during the inquiry period had a policy to charge a price extra of [REDACTED] USD/MT for galvanized steel exported to Australia if boron is added.

### 4.2.7. 'Switch' of supply

If your company 'switched' from supplying non-alloy galvanised steel to alloyed galvanised steel during the assessment period, answer the following questions:

- a) What was the rationale for this switch in supply?

**ANSWER:** Yieh Phui first commenced exporting alloyed galvanized steel in year 2013 in response to its Australian customer's request of solutions to minimize strain ageing effect.

- b) Was this in response to a specific request from your Australian customer(s)?

**ANSWER:** Yes, this was in response to the Australian customer's request of solutions to minimize strain ageing effect.

- c) What alterations to your manufacturing process and/or sales process were necessary as a result of this shift in supply?

**ANSWER:** There were no alterations to Yieh Phui's manufacturing process or sales process made as a result of this shift in supply. However, Yieh Phui had to purchase boron-added hot-rolled steel coils instead of non-alloy hot-rolled steel coils for the purpose of this shift.

- d) When did you first commence exporting alloyed galvanised steel to Australia?

**ANSWER:** Yieh Phui first commenced exporting alloyed galvanized steel Australia in year 2013.

## 4.3. Sales to other markets

### 4.3.1. Domestic sales

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- a) Did you sell alloyed galvanized steel on your domestic market during the relevant inquiry period?

**ANSWER:** Yes, Yieh Phui sold a small amount of alloyed galvanized steel on the domestic market during the inquiry period. Please see Exhibit 9 for a list of Yieh Phui's domestic sales of alloyed galvanized steel during the inquiry period. In Exhibit 10, Yieh Phui has also provided the sales documents as a sample of Yieh Phui's domestic sales of alloyed galvanized steel.

- b) If the answer to the above is yes:

- i. Provide a full description of all types of alloyed galvanized steel sold on the domestic market, including:
- a description of model of those goods (grade, coating mass, thickness and width)
  - what alloy(s) are included in those goods and in what quantities

**ANSWER:** Please see Exhibit 9 for descriptions of the alloyed galvanized steel sold on the domestic market during the inquiry period. All of the alloyed galvanized steel sold on the market during the inquiry period was boron-added galvanized steel.

- ii. Identify which (if any) of these products are identical to the circumvention goods exported to Australia during the inquiry period.

**ANSWER:** In the Excel spreadsheet provided in Exhibit 9, Yieh Phui has identified those domestic sales of alloyed galvanized steel sold on the domestic market during the inquiry period which had identical product characteristics to those exported to Australia during the inquiry period. In determining whether a product sold on the domestic market is identical to any of those exported to Australia, Yieh Phui has considered the product characteristics including standard, specification, coating mass, thickness (BMT basis) and width.

- iii. If applicable, explain how alloyed galvanized steel sold on the domestic market differ from alloyed galvanized steel sold to Australia:
- physically;
  - through their manufacturing process; or
  - in purpose/end use.

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**ANSWER:** Except for some variations on coating mass, thickness and width, the alloyed galvanized steel sold on the domestic market is generally the same as the one sold to Australia, in terms of manufacturing process and purpose/end use.

### 4.3.2. Third country sales

- a) Did you sell alloyed galvanised steel to any other export market(s) (besides Australia) during the relevant inquiry period?

**ANSWER:** Yes, Yieh Phui sold alloyed galvanized steel to third export markets beside Australia during the inquiry period. Please see Exhibit 11 for a list showing all the sales of alloyed galvanized steel exported by Yieh Phui to third countries during the inquiry period.

In Exhibit 12, please see the sales documents of two transactions selected from Exhibit 11 as samples. The first one was a sale of boron-added galvanized steel made by Yieh Phui to [REDACTED] for the shipment to [REDACTED]. The second sample was a sale of boron-added galvanized made by Yieh Phui to a trader named [REDACTED] for the shipment to [REDACTED]. Both sample transactions demonstrate the boron addition was specifically requested by the customer.

- b) If the answer to the above is yes:
- i. Provide a full description of all types of alloyed galvanised steel sold to each market, including:
- a description of model of those goods
  - what alloy(s) are included in those goods and in what quantities

**ANSWER:** Please see Exhibit 11 for descriptions of the alloyed galvanized steel exported to third countries during the inquiry period. All of the alloyed galvanized steel exported to third countries during the inquiry period was boron-added galvanized steel.

- ii. Identify which (if any) of these goods are identical to alloyed galvanised steel exported to Australia during the inquiry period.

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**ANSWER:** In the Excel spreadsheet provided in Exhibit 11, Yieh Phui has identified those third-country sales of alloyed galvanized steel during the inquiry period which had identical product characteristics to those exported to Australia during the inquiry period. In determining whether a product sold to third countries is identical to any of those exported to Australia, Yieh Phui has considered the product characteristics including standard, specification, coating mass, thickness (BMT basis) and width.

iii. If applicable, explain how alloyed galvanised steel sold on to third country markets differ from alloyed galvanised steel sold to Australia:

- physically;
- through their manufacturing process; or
- in purpose/end use.

**ANSWER:** Except for some variations on coating mass, thickness and width of the steel, the alloyed galvanized steel sold on to third country markets is generally the same as the one sold to Australia, in terms of manufacturing process and purpose/end use.

#### 4.4. Manufacturing process

Fully describe your manufacturing process of:

- alloyed galvanised steel; and
- non-alloy galvanised steel

Outline any particular differences in the production process of each of these goods, paying particular attention to the addition of alloys to the products.

**ANSWER:** Yieh Phui's manufacturing process undergone by alloyed galvanized steel is generally not indifferent from the one for non-alloy galvanized steel. As explained below, Yieh Phui's manufacturing process of alloyed and non-alloy galvanized steel involves three steps: pickling, cold-rolling and hot-dip galvanizing.

Yieh Phui's manufacturing process of galvanized steel starts at the pickling stage. At this stage, the purchased hot-rolled coil is pickled in a bath of hydrochloric acid to remove surface oxide (known as "scale") formed during the hot-rolling process conducted by Yieh Phui's suppliers.

The pickled steel coil is then processed through a cold-rolling mill, which uses a so-called reversible rolling method which reduces the steel strip to the desired substrate thickness.

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The cold-rolled steel coil is then introduced into the hot-dip galvanizing stage. Yieh Phui's hot-dip galvanizing line is a continuous one which involves several units including annealing, galvanizing, skin pass, tension leveling and resin coating/chromating. At this stage, the cold-rolled coil is first annealed to make it more formable because the cold-rolling process has hardened the steel. The annealed steel is then fed into the zinc bath for hot-dip galvanizing. The galvanized steel then goes through skin pass (if necessary) to improve the formability. The steel then goes through the tension leveling unit to improve the shape. Finally, the galvanized steel is then coated with resin or is chromated if surface treatment is required by the customer.

In sum, Yieh Phui's manufacturing process of alloyed galvanized steel is generally the same as the one of non-alloy galvanized steel. However, there are still some differences in manufacturing conditions between alloyed galvanized steel and non-alloy galvanized steel manufactured by Yieh Phui.

For instance, Yieh Phui has found that the alloyed hot-rolled steel used as raw material inputs by Yieh Phui for the production of alloyed galvanized steel have thinner scale on the surface than non-alloy hot-rolled steel, which generally makes it easier for Yieh Phui at the pickling process to remove it. In addition, alloyed hot-rolled steel strips are easier to be trimmed, which means there are lesser defects (such as edges cracks and burrs) found on alloyed hot-rolled steel after the trimming process.

Furthermore, it has been Yieh Phui's production experiences that alloyed hot-rolled steel is easier to be cold-rolled in order to reduce the steel thickness due to the lower level of steel strength than that of non-alloy hot-rolled steel. This means that the rolling force required at the rolling mill for alloyed hot-rolled steel is not as much as that required for non-alloy hot-rolled steel. This also means that at the cold-rolling step, less energy is consumed for alloyed hot-rolled steel than for non-alloy hot-rolled steel.

### 4.5. Costing information

- a) Are there any differences between the cost to make and sell non-alloy galvanised steel and alloyed galvanised steel? If yes, provide details of these differences including differences in:
  - i. raw material costs;
  - ii. manufacturing overheads; and
  - iii. any other costs.

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**ANSWER:** The major cost difference between non-alloy galvanized steel and alloyed galvanized steel is on the purchase cost of raw materials. The differences in manufacturing overheads or any other costs between non-alloy galvanized steel and alloyed galvanized steel are minor.

During the inquiry period, [REDACTED] was Yieh Phui's major supplier of the hot-rolled steel coils used by Yieh Phui for the production of non-alloy galvanized steel. As for alloyed galvanized steel, Yieh Phui sourced the raw materials (i.e., alloyed hot-rolled coils) [REDACTED] during the inquiry period.

During the inquiry period, [REDACTED] charged Yieh Phui up to [REDACTED] NTD/MT of extras for alloyed hot-rolled coils. As demonstrated by the [REDACTED]'s price extras tables for boron-added steel that is provided in Exhibit 13, [REDACTED]'s price extras for boron addition in hot-rolled coils range from [REDACTED] NTD/MT to [REDACTED] NTD/MT depending on the specification/grade of hot-rolled coils.

- b) Provide a calculation of the difference in cost to make and sell non-alloy galvanized steel and alloyed galvanized steel, ensuring you itemise each individual cost difference.

Provide supporting evidence of this calculation (e.g. raw material invoices) and explain the calculation (including assumptions).

You may wish to submit this as an additional spreadsheet in the *Exporter Questionnaire – galvanized steel AC* Excel workbook.

**ANSWER:** Yieh Phui is unable to provide the requested cost to make and sell specifically for non-alloy galvanized steel and for alloyed galvanized steel because Yieh Phui's accounting system does not allow Yieh Phui to differentiate the cost to make and sell between non-alloy galvanized steel and alloyed galvanized steel.

Yieh Phui utilizes process costing method in its costing system. The cost of manufacturing calculated month by month is actual cost rather than standard cost. In the normal course of business, Yieh Phui's cost accounting system calculates and records manufacturing costs by production line without differentiating costs difference between product types.

For example, Yieh Phui's galvanizing stage produces three types of products: (1) galvanized steel coils, (2) 5% aluminium-zinc coated steel coils, and (3) 55% aluminium-zinc coated steel coils, and there are in total four galvanizing lines. For cost accounting purposes, Yieh Phui calculates production-line-specific (rather than product model specific) cost of manufacturing in its normal course of business. Thus, each galvanizing line has one unit cost of manufacturing for all three types of products being produced.

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As explained above, the major cost difference between non-alloy galvanized steel and alloyed galvanized steel is on the raw material costs (i.e., cost of hot-rolled coils) instead of manufacturing overheads or other costs. In the normal course of business, Yieh Phui values raw material inventory by using the weighted-average method. However, in valuing the raw material, Yieh Phui differentiates raw material costs only by sizes (i.e., thickness and width) without tracing the costs by other product characteristics such as specifications or whether the raw material is alloyed or non-alloy steel. Thus, Yieh Phui is unable to differentiate the raw material cost difference between the non-alloy and alloyed steel.

Furthermore, Yieh Phui's accounting staff would not consider any method that could reasonably differentiate the raw material difference through certain allocation method. This is mainly because the alloyed raw material accounts for a relatively small portion of the entire raw material purchases. Even if the raw material cost difference between alloyed and non-alloy steel can be allocated through certain allocation method, the difference would probably be overridden by other factors such as cost differences resulting from timing and steel specifications given that the costs are calculated by using data over a long time period.

In light of the above, Yieh Phui respectfully requests the Commission exempt Yieh Phui from reporting the requested cost to make and sell for non-alloyed galvanized steel and alloyed galvanized steel.

### 4.6. Purpose and end use

- a) Describe the purpose(s) and end use(s) of:
  - i. the goods (non-alloy galvanised steel); and
  - ii. the circumvention goods (non-alloy galvanised steel).

**ANSWER:** The majority of both the non-alloy galvanized steel and alloyed galvanized steel that Yieh Phui exported to Australia during the inquiry period was used by the downstream processors in Australia to make purlin for building constructions. There is no difference in purposes or end uses between the non-alloy galvanized steel and alloyed galvanized steel that Yieh Phui exported to Australia during the inquiry period.

- b) Are there any specific purpose(s) and/or end use(s) that alloyed galvanised steel goods you export are suitable for that non-alloy galvanised steel are not suitable for? Provide specific product details and supporting evidence where possible.

## PUBLIC RECORD

**ANSWER:** The alloyed galvanized steel goods that Yieh Phui exported to Australia are suitable for downstream customers who has longer raw material inventory turnover time and who has greater demand on the formability of steel.

As explained in the answer to question 4.2.5 (d) above, the alloyed galvanized steel that Yieh Phui exported to Australia was made in response to the customer's request of minimizing the strain ageing effect. In addition, it is Yieh Phui's experiences that the addition of boron also enhances the formability of the galvanized steel it exported to Australia.

The above-mentioned advantages of boron-added galvanized steel can be attributed to the following metallurgical effects:

### 1. Boron nitride effect

Nitrogen can be found in all steels, which can enter the steel as an impurity or as an intentional alloying addition. It is generally undesirable as an impurity, causing embrittlement issues (*i.e.*, loss of ductility) and affecting strain ageing. Thus, for the hot-rolled steel coils used by Yieh Phui for the production of galvanized steel, nitrogen is typically controlled at below [REDACTED]% by weight in order to meet the property requirements. The addition of boron helps minimizing the undesirable effect of nitrogen, as boron has strong affinity for nitrogen and boron would react with nitrogen to form boron nitride, even with a minute quantity of boron addition. The decrease of nitrogen as a result helps minimizing strain ageing of steel and consequently enhances the ductility and formability.

### 2. Precipitation effect

In low carbon steel such as the one used by Yieh Phui for the production of galvanized steel (either alloyed or non-alloy) exported to Australia, aluminium is a necessary element added in by the hot-rolled coil supplier at the steel making process. Aluminium, like boron, has strong affinity for nitrogen and thus easily reacts with nitrogen to form aluminium nitride. However, aluminium nitride has an adverse effect which makes the steel in a higher level of strength and thus makes the steel less formable. The addition of boron can minimize the adverse effect caused by aluminium nitride. It is found that during the course of hot-rolling, the particles of boron move rapidly to the ferrite grain boundary and circumvent the formation of aluminium nitride, which speeds up the growth of ferrite grain size. The coarser ferrite grain size then results in a lower level of strength making the steel more formable.

- c) Are there any purpose(s) and/or end use(s) that alloyed galvanised steel and non-alloy galvanised steel can be used interchangeably for?

## PUBLIC RECORD

**ANSWER:** In terms of purposes and end uses of the alloyed galvanized steel and non-alloy galvanized that Yieh Phui exported to Australia during the inquiry period, both products generally can be used interchangeably.

### 4.7. Open comments

If your company wishes to make any general comments about whether it has engaged in a circumvention activity through the slight modification of non-alloy galvanized steel (for the purposes as outlined in Regulation 48(2) of the *Customs (International Obligations) Regulation 2015*), it may take the opportunity to do so in response to this questionnaire.

Alternatively, separate submissions to the investigation may be made directly to the Commission at the following address:

The Director  
Operations 2 - Anti-Dumping Commission  
Department of Industry and Science  
GPO Box 9839  
Canberra, ACT 2601

or by email at [operations2@adcommission.gov.au](mailto:operations2@adcommission.gov.au).

Interested parties wishing to participate in the inquiry must ensure that submissions are lodged promptly as legislative timeframes and restrictions apply to the receipt and consideration of submissions.

Refer to Australian Dumping Notices 2015/55 and 2015/69 for further information on these restrictions.

### **Yieh Phui's Comments:**

The addition of boron in the galvanized steel that Yieh Phui exported to Australia during the inquiry period was neither incidental nor intentional for the purpose of circumventing antidumping duties. Rather, the addition of boron was in response to the Australian customers' request to minimize the strain ageing effect of steel as explained above. The boron content in the alloyed galvanized steel that Yieh Phui exported to Australia ranged generally from [ ] ppm to [ ] ppm (i.e., [ ]% to [ ]% by weight). This level of boron content is way more than what is needed to avoid the antidumping duties and only this level of boron content is sufficient to minimize the strain ageing effect of steel.

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From year 2013, Yieh Phui began shipping boron-added galvanized steel to Australia. The timing of Yieh Phui's inception of shipments of boron-added galvanized steel to Australia may coincide with the timing of dumping duty notice in respect of galvanized steel, this coincidence does not preclude the metallurgical and commercial reasons of the need for boron-added galvanized steel.

As explained above, the addition of boron has two major metallurgical effects (i.e., the boron nitride effect and the precipitation effect) to the low carbon steel like the one used by Yieh Phui for the production of galvanized steel. These effects cause a lower level of steel yield strength and consequently minimize the stain ageing and enhance the formability of steel. Commercially the boron-added steel meets the Australian customers' need to minimize the strain ageing when experiencing a longer inventory turnover time period.

Thus, it is Yieh Phui's position that the boron-added galvanized steel it shipped to Australia is not a product with a slight modification of boron-free galvanized steel exported to Australia. Instead, the boron-added galvanized steel Yieh Phui shipped to Australia and other countries is a product different from the boron-free galvanized steel that the customer usually has to specifically order for it.

The boron-added galvanized steel is a different product from the boron-free galvanized steel and can be supported by Yieh Phui's sales to [REDACTED]. As demonstrated by the sample sales documents provided in Exhibit 11, [REDACTED] specifically ordered from Yieh Phui the boron-added galvanized steel for the shipment to [REDACTED]. [REDACTED] not only requested for the boron addition, but also requested the boron content to fall within certain range, knowing that the steel strength would be in a lower level as a result of the boron addition. [REDACTED]'s request of the maximum yield strength of steel in that transaction implies that a higher level of yield strength was not intended. This also supports that the boron addition serves certain special need of the customer and that need is commercially significant.

In light of the above, we respectfully request the Commission to find that the alloyed galvanized steel that Yieh Phui shipped to Australia during the inquiry period not a product with a slight modification of boron-free galvanized steel exported to Australia and terminate this inquiry.

**5. EXPORTER'S DECLARATION**

I hereby declare that Yieh Phui Enterprise Co., Ltd. and its related trading company Asiazone Co. Limited have completed the attached questionnaire and, having made due inquiry, certify that the information contained in this submission is complete and correct to the best of my knowledge and belief.

**Name : Gary Wen-Chung Tien**

**Signature :** 

**Position in**

**Company : General Manager of Finance Division**

**Date : July 27, 2015**

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### **LIST OF EXHIBITS**

- 1. E United Group brochure**
- 2. Affiliates**
- 3. Australian Standard (AS 1397)**
- 4. Japanese Industrial Standard (JIS G 3302)**
- 5. Models of non-alloy and alloyed galvanized steel sold by Yieh Phui to Australia during the inquiry period**
- 6. Australian customer information**
- 7. Yieh Phui/Asiazone's sales of non-alloy galvanized steel and alloyed galvanized steel to Australia during the inquiry period**
- 8. Sample documents of sales of non-alloy and alloyed galvanized steel to Australia**
- 9. Yieh Phui's domestic sales of alloyed galvanized steel during the inquiry period**
- 10. Sample domestic sales documents for alloyed galvanized steel**
- 11. Yieh Phui's third country sales of alloyed galvanized steel during the inquiry period**
- 12. Sample sales documents for third country sales of alloyed galvanized steel**
- 13. [REDACTED] price extras tables**

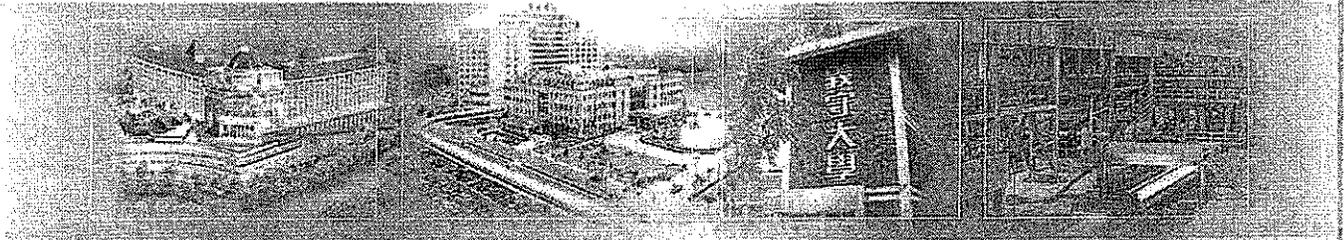
# Exhibit 1



聯合集團  
UNITED GROUP



歷經一番的洗鍊  
才能展出耀眼的光輝  
積極的向前邁進  
才能嘗到甜美的果實  
創新、成長、責任、永續  
是我們遵循的方向  
堅持做到最好  
是我們唯一的原則  
一步一腳印  
與您一同成長



創新  
Innovation

成長  
Growth

責任  
Responsibility

永續  
Continuity

*Smelting and polishing  
produces glaring shine.*

*Assertive steps ahead  
promise us the fruitful results.*

*Innovation, growth, responsibility and continuity*

*are our guiding posts.*

*Commitment to the best*

*is our only insistence.*

*Step by step forwards;*

*let us grow together.*

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## 教育事業體 *Education*

|         |    |                             |
|---------|----|-----------------------------|
| 義守大學    | 07 | I-Shou University           |
| 義大國際中小學 | 09 | I-Shou International School |

## 醫療事業體 *Medical Services & Health Care*

|      |    |               |
|------|----|---------------|
| 義大醫院 | 11 | E-Da Hospital |
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## 地產及休閒事業體 *Real Estate and Leisure Business*

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| 義大開發股份有限公司 | 15 | E-DA Development Corp.     |

## 生產事業體 *Manufacturing*

|                |    |  |
|----------------|----|--|
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| 聯衆(廣州)不銹鋼有限公司  | 29 | Lian Zhong Stainless Steel Corp.                             |
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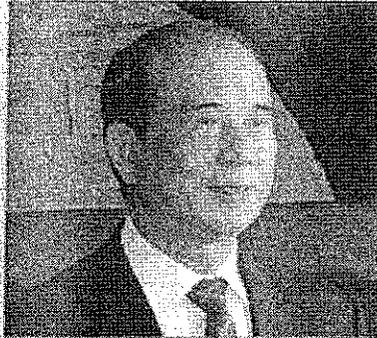
**E UNITED GROUP**



# 創辦人的

# 話

# Words From The Founder



醫學微觀至小無小  
宇宙宏觀至大無大

林義守 題



事業發展的軌跡，係不斷追求卓越的歷程。義聯集團自民國67年首創輝興公司迄今，已從鋼鐵基礎產業發展至教育事業，並跨足醫療體系，展現了企業「取之於社會，用之於社會」的理念，期間雖歷經艱辛，但仍秉持著「創新、成長、責任、永續」經營哲學，迎接挑戰，淬鍊出嶄新的格局。隨著義大國際中小學與義大醫院的建構完成，義聯集團已邁向以人一生的照護體系：

- 幼有所教：中小學、大學能培養社會所需的人才
  - 壯有所用：生產事業能提供安身立命的工作環境
  - 老有所養：醫院與護理之家能安享平安健康的晚年
- 滿懷感恩的心，義聯集團仍一本創業的初衷，能不斷的投资與建設台灣，以造福廣大民眾為主軸，回饋鄉親長期以來對本集團的愛護與支持，義聯集團關心您，也願意伴您一生！

The path of business development is a journey of the continuous pursuit of excellence. Since the establishment of Yieh Hsing Enterprise in 1978, E United Group has expanded from its core business, the steel industry, to the education sector, as well as the medical care service. This demonstrates the Group's main goal of contributing to society.

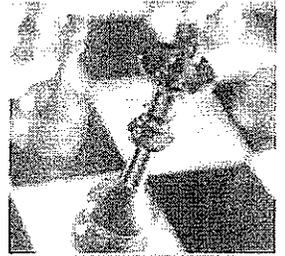
Having overcome several obstacles in the past, the E United Group remains able to maintain its business philosophy of innovation, growth, responsibility and continuity. Today, the group is prepared to face challenges and make an innovative breakthroughs by establishing the I-shou International School and E-De Hospital. E United Group has committed to provide a life-time service for young and old.

**Education:** Generate highly trained individuals for the benefit of society through the education of youth in its elementary schools, high schools and universities.

**Employment:** Provide employment and career development opportunities for talented individuals in its manufacturing business.

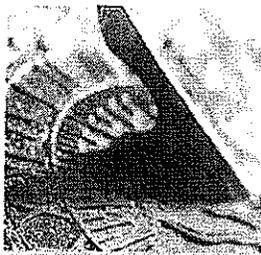
**Care for the elderly:** Ensure a pleasant and healthy living conditions for the elderly in its Hospital & Nursing Home.

Since incorporation, the E United Group has shown continuous dedication toward its intention to keep investing in and improving Taiwan. Furthermore, the Group is committed towards providing superior benefits to the public in return for their long-term support of the Group. E United Group cares for you, and will be your life-time companion.



集團組織  
Group's Organization

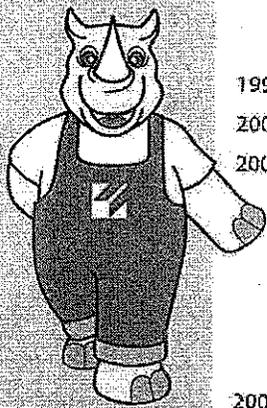




# 集團大事

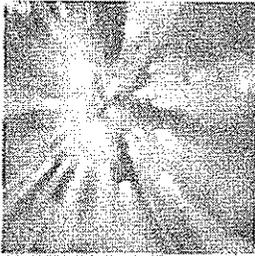
## 紀

### Group's History



- 1978 7月 創立輝興企業股份有限公司。
- 1980 9月 輝興鋼管一廠建廠完成，生產各種鋼管及鍍鋅鋼管。
- 1985 12月 教育部核准設立「高雄工學院」，校址位於高雄縣大樹鄉觀音山。
- 1986 3月 原國喬企業股份有限公司更名為輝興企業股份有限公司。
- 6月 輝興第一廠建廠工程開始施工。
- 1988 3月 煒茂實業股份有限公司設立。
- 10月 輝興股票公開發行正式上市。
- 12月 輝興鋼鐵股份有限公司成立。
- 1989 11月 聯統鋼鐵股份有限公司成立。
- 1990 1月 輝興第一座冷軋機試車生產。
- 5月 「高雄工學院」奉教育部核准參加79年度大學聯合招生。
- 5月 輝興第一條酸洗線試車生產。
- 12月 輝興第一條連續烤漆線試車生產。
- 1991 5月 輝興第一條連續熱浸鍍鋅線試車生產。
- 11月 輝興不銹鋼線材廠試車生產。
- 12月 聯統鋼鐵股份有限公司更名為「聯統重工股份有限公司」。
- 1992 1月 「輝隆集團」成立。
- 1994 7月 慈恩醫院向衛生署申請設立(一般800床、特殊127床、精神科20床、慢性復健400床)。
- 1995 3月 輝興股票上市案經台灣證券交易所股份有限公司審核通過。
- 5月 輝興熱軋廠及冷軋廠開始生產。
- 9月 輝興煉鋼廠一號電爐、轉爐、真空精煉爐及廢鋼壓連鑄機開始生產。
- 1996 4月 輝興連鑄廠小鋼胚連鑄機開始生產。
- 1997 8月 教育部核准高雄工學院改制為「義守大學」。
- 11月 輝興屏東不銹鋼管廠試車完成，投入生產行列。
- 1998 10月 山海觀建設股份有限公司設立。
- 2000 2月 集團更名為「義聯集團」。
- 2000 7月 衛生署同意慈恩醫院更名為「財團法人義大醫院」。
- 9月 山海觀建設股份有限公司名稱變更為泛喬股份有限公司。
- 9月 衛生署正式核發義大醫院建院許可(急性一般病床500床及護理之家500床)。
- 2001 4月 大陸「常熟密揚新興建材有限公司」正式動土開工。
- 12月 大陸聯衆(廣州)不銹鋼有限公司核准設立。
- 2001 12月 義大醫院舉行奠基動土典禮。
- 2002 11月 大陸「常熟欣瑞科技材料有限公司」正式動土開工。
- 12月 聯衆一期工程舉行奠基典禮。
- 2003 3月 輝興供購輝興鋼管及冷軋廠。
- 3月 集團更名為「義聯集團」。
- 2004 1月 常熟欣瑞公司設備基礎開工。
- 1月 「義大國際中小學」核准立案。
- 3月 義大醫院取得開業執照總床數共402床，科別：18科設置；一般急性病床250床、特殊病床152床。
- 4月 義大醫院正式營運。
- 4月 高雄縣政府核准義大國際中小學開始招生。
- 8月 義大醫院通過區域教學醫院暨乙類教學醫院鑑定。
- 10月 泛喬養生村、商店街、生機園區、SPA會館、景觀餐廳等工程動工。
- 12月 常熟欣瑞公司酸洗線及第一座冷軋機試車生產。
- 12月 聯衆連續冷軋酸洗線正式投產。
- 2005 1月 義大醫院總開放床數共1021床。
- 2月 聯衆煉鋼廠開始興建。
- 3月 常熟欣瑞公司第一條連續烤漆線及第一條連續熱浸鍍鋅線試車生產。
- 4月 聯衆熱軋退火酸洗線投產。
- 7月 衛生署核定義大醫院為腎臟及肝臟摘取、移植手術之醫院。
- 9月 經濟部核准輝興與聯統重工合併案。
- 11月 義大開發股份有限公司設立。
- 2006 3月 義大開發(義大世界廣場)購物及主題樂園動土開工典禮。
- 6月 聯衆熱軋廠熱軋連軋線投產。
- 10月 衛生署核准新增急性一般病床100床，急性一般病床總床數900床。
- 10月 常熟欣瑞科技材料有限公司更名為輝興(中國)科技材料有限公司。
- 12月 義大醫院成功完成首例肝臟、腎臟移植。
- 2007 2月 聯衆煉鋼廠投產。
- 7月 義大醫院榮獲2007年經濟部「節約能源績優獎」之傑出獎。
- 9月 教育部核准義大國際中小學增設高中部。
- 10月 越南廣聯鋼鐵責任有限公司舉行奠基動土典禮。
- 11月 義大醫院國際人道救援-治療梅毒淋巴水腫病人。

- July 1978 Yieh Hsing Enterprise Co., Ltd was established.
- Sep. 1980 The commissioning of Yieh Hsing's No.1 Pipe and Tube Mill.
- Dec. 1985 Ministry of Education approved the establishment of "Kaohsiung Polytechnic Institute", located in Ta-Hsu Hsiang, Kaohsiung County.
- Mar. 1986 Kuo Chiao Enterprise Co., Ltd. was renamed as Yieh Phui Enterprise Co., Ltd..
- June 1986 Yieh Phui began its Stage One construction.
- Mar. 1988 Yieh Mau Corporation was incorporated.
- Oct. 1988 Yieh Hsing had its common stock listed on Taiwan Stock Exchange.
- Dec. 1988 Yieh United Steel Corporation (YUSCO) was established.
- Nov. 1989 Lien Tong Steel Co., Ltd. was incorporated.
- Jan. 1990 The commissioning of Yieh Phui's first Cold Rolling Mill.
- May 1990 Kaohsiung Polytechnic Institute was approved by Ministry of Education to enroll students via the National University Entrance Exam Program.
- May 1990 The commissioning of Yieh Phui's first Pickling line.
- Dec. 1990 The commissioning of Yieh Phui's first Continuous Pre-painting line.
- May 1991 The commissioning of Yieh Phui's first Continuous Hot-dip Galvanizing line.
- Nov. 1991 The commissioning of Yieh Hsing's Stainless Steel Wire & Rod plant.
- Dec. 1991 Lien Tong Steel Co., Ltd was renamed as Lien Kang Heavy Industrial Co., Ltd.
- Jan. 1992 The Yieh Loong Group was established.
- July 1994 Application was submitted to Department of Health for establishing Chi-An Hospital (800 acute general beds, 127 special beds, 20 psychiatry beds and 400 rehabilitation beds).
- Mar. 1995 Yieh Phui was approved for listing of common stocks by the Taiwan Stock Exchange Corporation.
- May 1995 YUSCO had its Hot Rolling Mill and Cold Rolling Mill begin production.
- Sep. 1995 YUSCO had its first Electric Arc Furnace, Converter, Vacuum Oxygen Decarburization Facility and Slab Continuous Caster in Steel Making plant begin production.
- Apr. 1996 YUSCO had its Billet Continuous Caster in Continuous Casting Plant begin production.
- Aug. 1997 Ministry of Education approved "Kaohsiung Polytechnic Institute" to be renamed as I-Shou University.
- Nov. 1997 Yieh Hsing had its Stainless Steel Welded Pipe plant in Ping-Tung begin production.
- Oct. 1998 The establishment of Formosa Construction Corp.
- Feb. 2000 The group was officially renamed as "Yieh United Group".
- July 2000 Chi-An Hospital was approved by Department of Health to be renamed as E-DA Hospital.
- Sep. 2000 Formosa Construction Corp. was officially renamed as Eliter International Corp.
- Sep. 2000 Department of Health officially approved the construction of E-Da Hospital (500 acute general beds, 500 nursing home beds).
- Apr. 2001 Changshu Sino Chief Leading Edge Construction Material Co., Ltd. (China) began its construction.
- Dec. 2001 The construction of LISCO was approved.
- Dec. 2001 E-DA Hospital began its construction.
- Nov. 2002 Changshu Sino Leading Technomaterial Co., Ltd. (China) began its construction.
- Dec. 2002 LISCO began its Stage One construction.
- Mar. 2003 Yieh Phui took over Yieh Hsing's Steel Pipes and Cold Rolling operation.
- Mar. 2003 The group was officially renamed as "E United Group".
- Jan. 2004 Changshu Sino Leading Technomaterial Co., Ltd began its construction.
- Jan. 2004 I-Shou International School was approved for its establishment.
- Mar. 2004 E-Da Hospital was granted the operation license, with a total of 402 beds, including 250 acute & general beds and 152 special beds in 18 medical departments.
- Apr. 2004 E-DA Hospital officially began its operation.
- Apr. 2004 I-Shou International School was approved by Kaohsiung County Government to begin enrolling students.
- Aug. 2004 E-Da Hospital was qualified as an Educational Hospital.
- Oct. 2004 Eliter International Corp. began its construction on projects such as "Silver Village," "Shopping Districts," "Dream Empire," "SPA Resort," and "Panoramic Restaurant," etc.
- Dec. 2004 The commissioning of Pickling line and the first Cold Rolling Mill in Changshu Sino Leading Technomaterial Co., Ltd., China.
- Dec. 2004 The commissioning of LISCO's White Rolling Annealing and Pickling (WRAP) line.
- Jan. 2005 The No. of opening beds in E-Da Hospital was totaled 1021.
- Fed. 2005 LISCO began its steel making plant construction.
- Mar. 2005 The commissioning of the first Continuous Pre-painting line and Continuous Hot-dip Galvanizing line in Changshu Sino Leading Technomaterial Co., Ltd., China.
- Apr. 2005 The commissioning of LISCO's Hot Rolling Annealing and Pickling Line.
- July 2005 E-Da Hospital became qualified kidney, cadaver liver and living-donor liver extirpation and transplantation hospital officially approved by Department Of Health.
- Sep. 2005 Ministry of Economic Affairs approved the merger of Yieh Phui and Lien Kang Heavy Industrial Co., Ltd.
- Nov. 2005 E-Da Development Corp. was incorporated.
- Mar. 2006 E-Da Development Corp. began its construction on projects such as "E-Da World Plaza" and "E-Da Theme Park".
- June 2006 LISCO had its Hot Rolling Mill begin production.
- Oct. 2006 E-Da Hospital increased one hundred acute beds officially. The totality of acute beds was nine hundred beds.
- Oct. 2006 Sino Leading Technomaterial Co., Ltd. was renamed as Yieh Phui (China) Technomaterial Co., Ltd.
- Dec. 2006 E-Da Hospital completed a liver transplantation and kidney transplantations successfully. That was the first instances of E-Da Hospital. The hospital transplanted a liver and two kidneys separately to three patients.
- Fed. 2007 LISCO had its steel making plant begin production.
- July 2007 E-Da Hospital had the honor to receive an Outstanding Award of 2007 Excellent Award for Energy Economizing awarded by Ministry of Economic Affairs.
- Sep. 2007 Department of Senior High in I-Shou International school was approved for its establishment.
- Oct. 2007 Guang Lian Steel (VIETNAM) Co., Ltd. began its construction.
- Nov. 2007 E-Da Hospital had the first case of Humanitarian Rescue Action.



# 四大 事業

體

*The Four Business Sectors*

- 教育事業體  
義守大學  
義大國際中小學
- 醫療事業體  
義大醫院
- 地產及休閒事業體  
泛喬公司  
義大開發
- 生產事業體  
輝輝企業
  - 輝輝(中國)科技材料(大陸)
  - 常熟啓揚新興建材(大陸)
- 輝聯鋼鐵
  - 聯衆(廣州)不銹鋼(大陸)
- 輝興企業  
輝茂實業



- **Education:**  
I-Shou University  
I-Shou International School
- **Medical Services and Health Care:**  
E-Da Hospital
- **Real Estate and Leisure Business:**  
Eliter International Corp.  
E-Da Development Corp.
- **Manufacturing:**  
Yieh Phui Enterprise Co., Ltd.
  - Yieh Phui (China) Technomaterial Co., Ltd.
  - Changshu Chief Leading Edge Construction Materials Co., Ltd.
- Yieh United Steel Corp.
- Lian Zhong Stainless Steel Corp.  
Yieh Hsing Enterprise Co., Ltd.  
Yieh Mau Corp.

教育事業體  
*Education*

醫療事業體  
*Medical Services and Health Care*

## 生產事業體

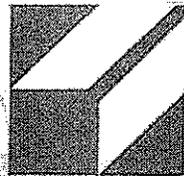
# Manufacturing

建構完成從幼稚園、小學、中學、大學、研究所的完整教育體系，是義聯集團教育文化事業體的目標願景。

E United Group's vision and goal for its education sector is to endorse a fully-integrated educational system ranging from kindergarten, elementary school, university to graduate school.

鋼鐵產業係義聯集團的核心事業，強化各項產品的價值，提供客戶更好的服務，積極佈局全球，建構更堅實的營運體系，創造競爭優勢，是生產事業體的目標願景。

Steel industry is the core business of E United Group. Adding value to our products, providing even better customer services, actively building a global network, constructing a solid operation and creating competitive advantages are the vision and goal of the manufacturing sector.



義聯集團  
E UNITED GROUP

## 地產及休閒事業體

# Real Estate and Leisure Business

義大醫院的建院理念就是要給社會大眾最好的五星級設施、五心級服務，實現創辦人回饋大眾的心願。

The founding principles of E-Da hospital is to provide patients with five star service, which fulfills Mr. Lin's wishes to pay back to the community.

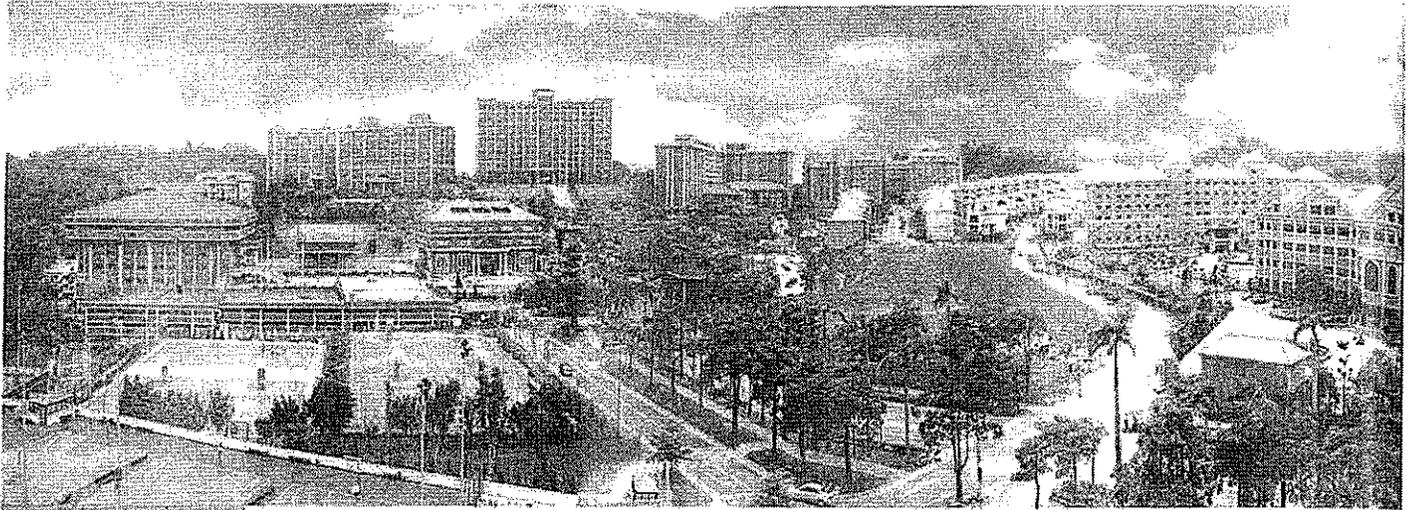
掌握時代趨勢，有效運用資源，創造無限價值，成為形象的標竿企業，以前瞻的視野，恢宏的胸懷，創造具觀光、人文、休閒的優質生活環境，成為地產及休閒事業的標竿。

With a forward-looking vision and all-embracing mind, a high-quality life environment encompassing tourist attractions, humanistic features and recreational facilities is created. It will become a landmark for the real estate and leisure business industry.



義守大學

I-SHOU UNIVERSITY



**創設日期：**中華民國75年，原名高雄工學院，民國86年更名為義守大學

**師資：**博士師資佔總師資人數的87%

**設立院學系所：**至民國97年共有理工、電機資訊、管理、語文暨傳播、醫學等五個學院。包括31個學系暨一個管理學院學士班、17個碩士班、7個博士班及10個碩士在職進修專班、13個進修學士班與6個二年制在職專班。

**學生人數：**超過15000人

**校地面積：**校本部20.59公頃，燕巢分部：8.19公頃

**Date of Establishment:** I-Shou University (ISU), formerly known as Kaohsiung Polytechnic Institute (KPI), was first founded in 1986, and has renamed to its current name since 1997.

**Faculty:** 87% of the faculty holds doctorate degree at ISU

**Colleges:** Electrical Engineering & Information Science, Science & Engineering, Language and Communication, Management and Medicine

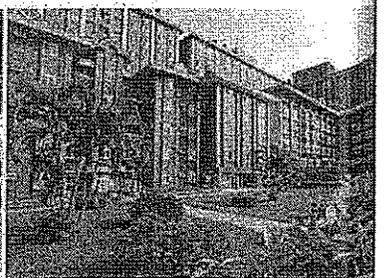
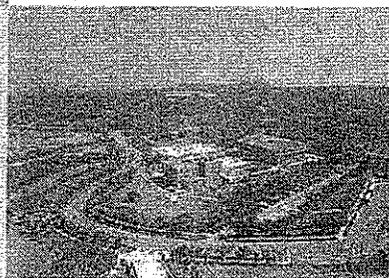
**Programs:** 31 undergraduate programs plus one join program, 17 master programs, 7 doctoral programs, 13 continuing education programs, 6 two-year vocational programs and 10 executive master programs

**Student enrollment:** over 15,000

**Campus Area:** Main Campus 20.59 hectares, Yan-Chiao Campus: 8.19 hectares

Education

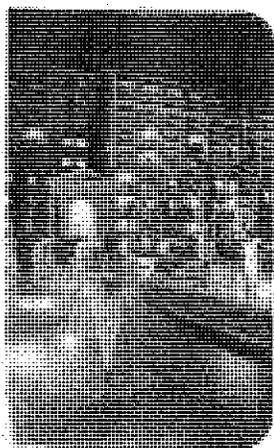
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義守大學於1986年創建於高雄縣觀音山東麓，是創辦人林義守先生本於感懷母恩與回饋鄉里之心而興辦。與義大國際中小學為鄰，形成一個獨立而完善的學區，是台灣南部最佳的私立綜合大學。秉持「理論與實用兼顧、授課與實驗並重」之教育理念，鼓勵教師引導學生從事跨領域、具學術精神及實用價值之研究。除兼顧人本與科技的教育宗旨，滿足學生在專業知識的追求，並期能對台灣的商務、工業及醫療系統有所貢獻。近年來更積極拓展與姐妹校間的交流合作，推動國際性的研究和教學合作。未來除了以設立醫學系為目標外，並將朝向國際知名的綜合大學發展而努力。



*With* more than 15,000 students in 5 colleges, ISU is the most complete and the largest private university in southern Taiwan. Established in 1986, years of endeavors allow ISU to offer high-quality, student-focused, practical higher education to students worldwide. The school boasts a stellar cast of teaching professionals, who have both academic and on-the-job credentials. 87% of the faculty members have doctorate degrees, the most in any private university in Taiwan. ISU curriculum is designed to integrate local area's unique features so that our students are trained to meet the exact needs of local industry. School programs are continuously improved through vigorous globalization strategies.





義大國際中小學

I-SHOU INTERNATIONAL SCHOOL



**創設日期：**2004年5月開始招生(南台灣第一所國際雙語中小學)

**位置：**高雄縣大樹鄉觀音山，緊臨義守大學

**校地面積：**38,000平方公尺

**招生規模：**依美式學制年級1-10年級，每年級共4班

**學校特色：**綠意盎然的環境/學術性的領域/藝術與人文的陶冶/

獨立自主的學習/積極進取的求知態度/資源豐富的圖資世界/

互助共榮的同儕關係/充滿活力歡樂的校園/具前瞻性的教學目標

**Date of establishment :** May, 2004

The first international school offering bilingual program in Southern Taiwan.

**Type of school:** Boarding and day school

**Location :** Adjacent to I-Shou University, on Mount Guan-yin in Kaohsiung County

**Lot Area :** 38,000-square meters

**Grade :** 1~10

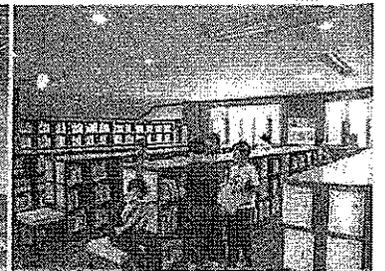
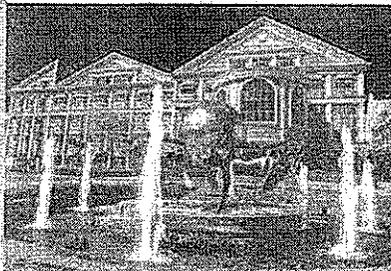
**Class :** Four classes per grade level

**Specialty : Lower school :** We are a candidate school implementing the PYP (Primary Years Program) of International Baccalaureate Organization (IBO)

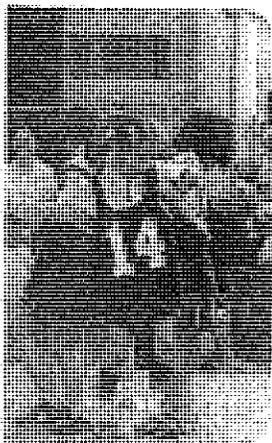
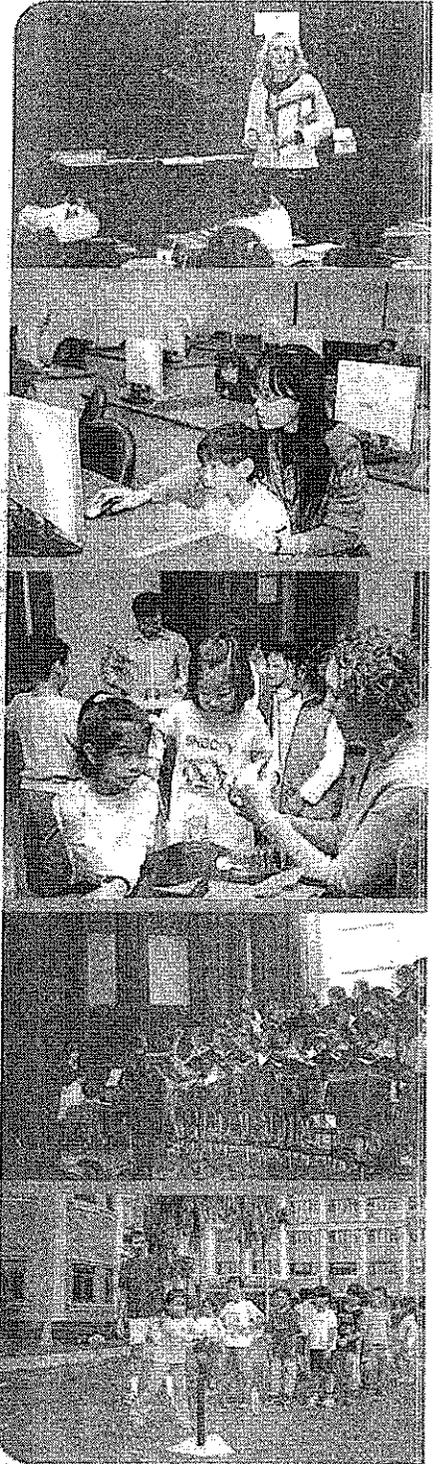
**Upper school :** We offer two distinctive programs aiming for the students to enter national universities and foreign universities

Education

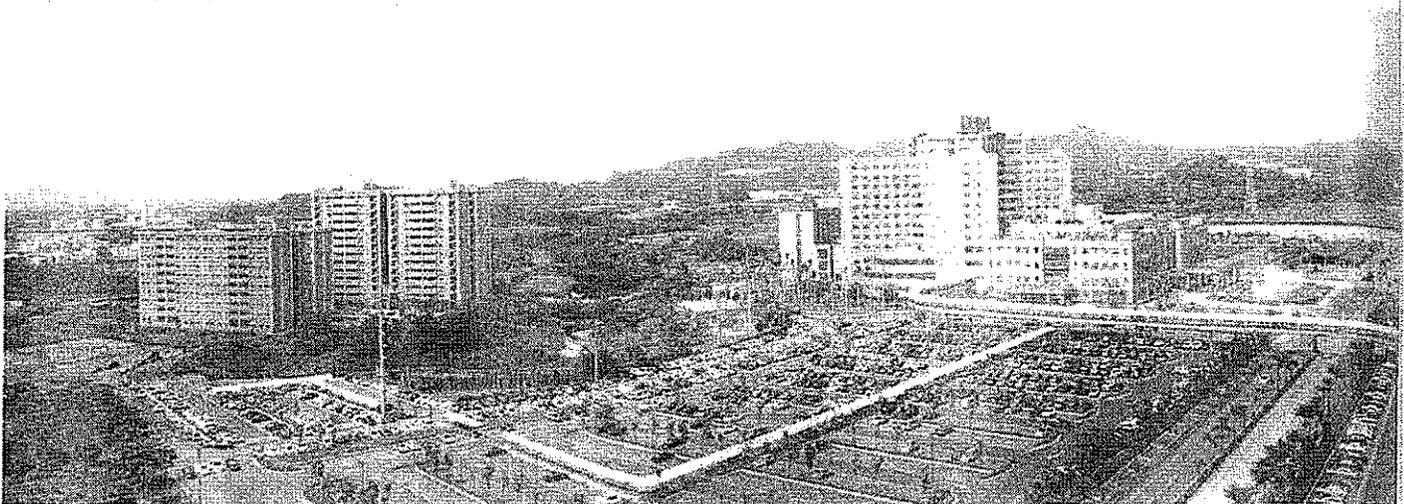
09 | 10



義大國際中小學教育宗旨在培育每一位成長中的小小心靈成為一個愛好學習者。我們堅信推展誠實、正直和同理心。學校的基石建立在努力教育我們的學生富有愛心、心胸開闊，且有原則的人格特質。藉由激勵交流使每位學生具備冒險精神，並能進一步發展成為終身學習者。我們努力提供身心均衡的課程，專注於學生自發性探索。最終目標為教育我們的學生使其懂得反思、讓世界更美好與和平，以貢獻社會。



*I*-Shou International School fosters in each growing mind a love for learning. We firmly believe in promoting honesty, integrity and compassion. The foundation of the school is based on making every effort to instill caring, open-minded and principled characteristics in each student. By encouraging communication, each student is prepared to take risks and further develop into a lifelong learner. We strive to provide a well-balanced program that centers on natural inquiry. The ultimate goal is to contribute to society by developing our graduates into reflective people that want a better and more peaceful world.



**設立日期：** 中華民國93年4月15日正式營運  
**員工人數：** 約2,000人  
**設置科別：** 內科部、外科部、骨科部、婦產部、病理部、放射醫學部、急診部、麻醉科及其他專科共36科  
**床數規模：** 急性一般933床、特殊288床、護理之家500床(規劃中)  
**六大治療中心：** 急救創傷中心、癌症醫療中心、心臟治療中心、器官移植中心、重建治療中心、神經醫學中心

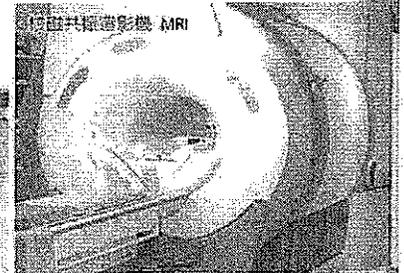
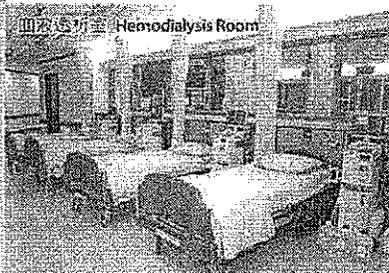
**Date of Establishment :** April, 2004

**Number of Employees :** 2,000

**Departments :** Internal Medicine, Surgery, Orthopedic Surgery, Gynecology and Obstetrics, Pathology, Radiology, Emergency Dept., Anesthesiology and Special Subjects, totally, 36 subjects.

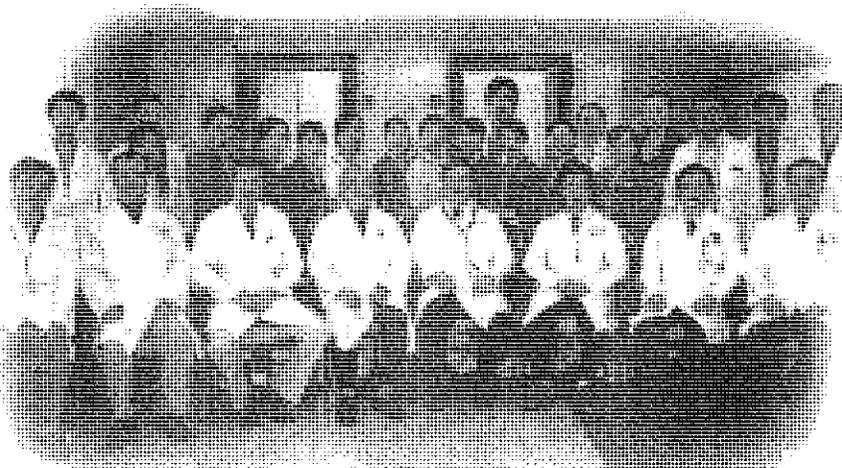
**Opening Beds :** Acute Beds 933, Special Beds 288, Home Care Center 500 (In Plan)

**Six Centers of Therapy :** Trauma & Emergency Center, Cancer Center, Cardiology and Cardiac Surgery Center, Transplantation Center, Center of Reconstructive and Aesthetic Surgery, Neurology Medicine Center.

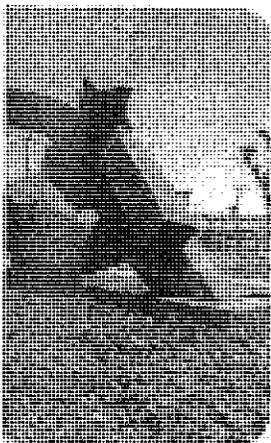


環境空間猶如五星級飯店的空間營造，戶外名家雕塑、室內鋼琴演奏、入口的水舞噴泉，其特有的藝術與人文氣息，讓每一位來到義大醫院的來賓，跳脫對傳統醫院的印象，沒有藥水味、充滿咖啡香，義大醫院不僅提供醫療服務，更是充滿著藝術氣息的休憩場所。

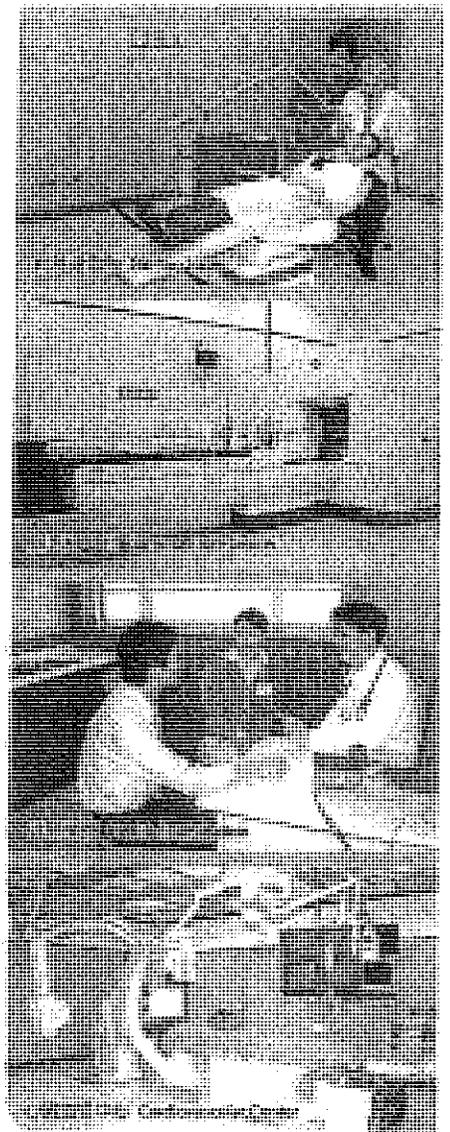
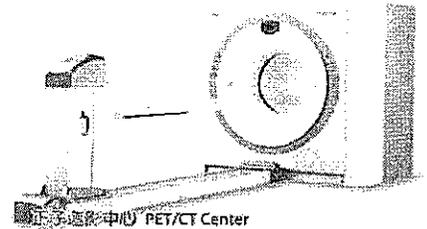
義大醫院醫療科別完整，醫師陣容來自各大醫學中心，義大醫院的醫療專精項目包括聲道重建手術、關節置換術、臂神經叢重建、內視鏡減重手術、手汗症治療、加馬刀手術、攝護腺雷射手術、睡眠監測、心導管手術等。義大醫院擁有許多先進的儀器設備，包括正子造影攝影儀（PET/CT Scan）、加馬刀（Gamma Knife）、64切電腦斷層造影（64 Slices CT Scan）等，提供病患高品質的醫療服務。



E-Da Hospital is comparable to a five star hotel: there are masters' sculptures, paintings, the lingering sound of the piano, and the water show of Life Fountain at the entrance. Walking into E-Da Hospital, you feel an atmosphere of unique art and humanity. Instead of the pungent odor of disinfectant, the aroma of coffee spreads all over the hospital. It completely changes the image of the traditional hospital because E-Da hospital is a place not only for medical treatment, but also for relaxation.

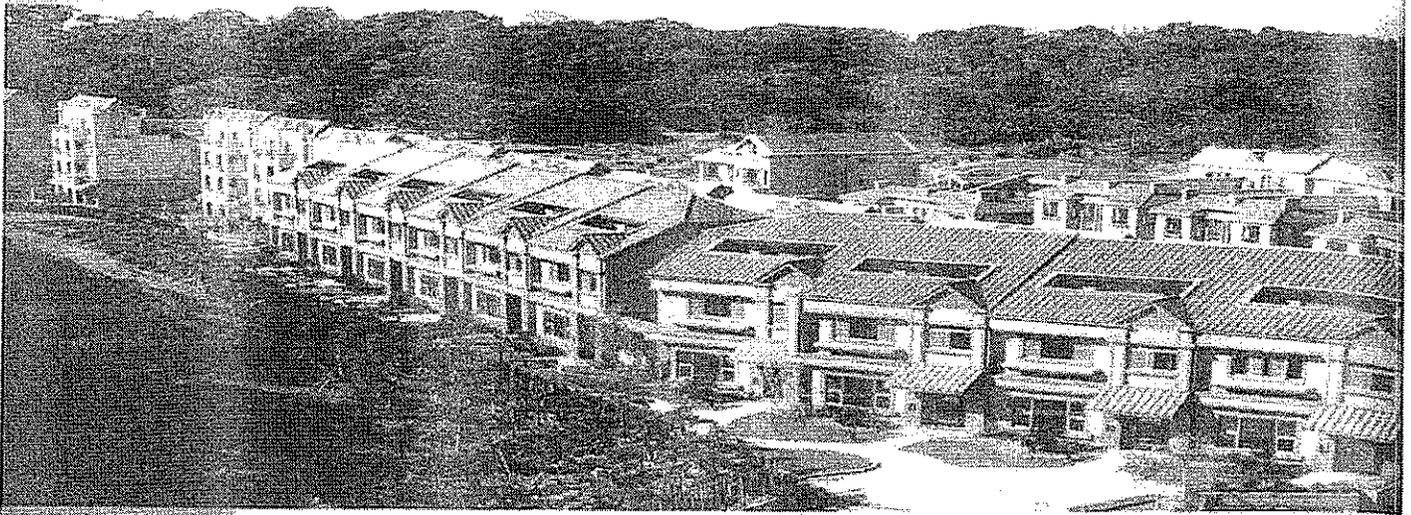


E-Da Hospital offers a wide variety of medical services. Most of the attending doctors come from major medical centers in Taiwan and are able to provide quality care in their medical specialties. We specialize in Esophageal and Voice Reconstruction, Total Joint Replacement, Treatment of Brachial Plexus Injury, Laparoscopic Bariatric Surgery, Treatment of Hyperhidrosis, Gamma Knife Radiosurgery, Prostate Laser Surgery, Polysomnography and Cardiac Catheterization Examination with Intervention. We also own the most technologically advanced equipment such as PET/CT, Gamma Knife, 64-Slice CT and MRI. We provide customers with high quality medical services.





益高股份有限公司  
ELITER INTERNATIONAL CORP.



設立日期：中華民國87年10月

資本額：新台幣23.225億元

員工數：約60人

營業項目：不動產投資開發、

設計規劃、興建與租賃

**Date of Establishment :** October, 1998

**Capital :** NT\$2.3225 billion

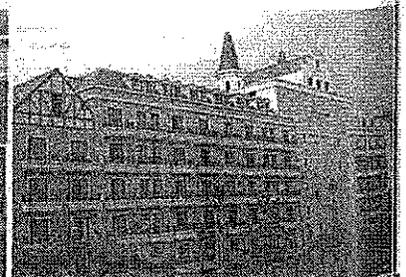
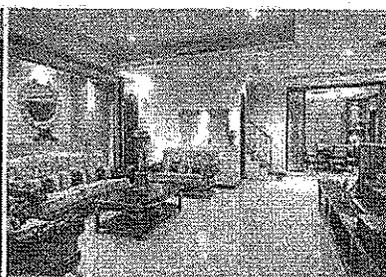
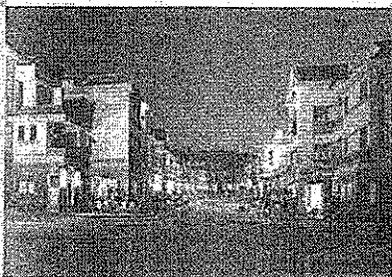
**Number of Employees :** 60

**Services :** Real estate development,

design, planning,

construction, sale and lease

Real Estate  
Development



泛喬公司是義聯集團地產及休閒事業體之核心成員，於1998年成立以來，首先以開發【義大城】為全國性的綜合開發特區為目標，並採取計劃單元整體開發方式(Planned Unit Development 簡稱PUD)去營造出自然舒適又兼具寧靜生活環境，使「義大城」成為一個具有學術人文與藝術氣息之城市，又兼具娛樂與感動的心靈休閒城市。

【義大城】本身位於高雄縣知名的風景區內，緊鄰義守大學與義大國際中小學之間，是一處典型的人文教育住宅。在整體建築語彙與造型上強調休閒，大致採歐式及美式社區風格，降低樓高減少環境壓迫感，增大棟距確保居住之隱私。重視全區之整體意向，整合建物風格與外觀語彙，為地產市場打造出與眾非凡與價值不墜的建築傳奇。



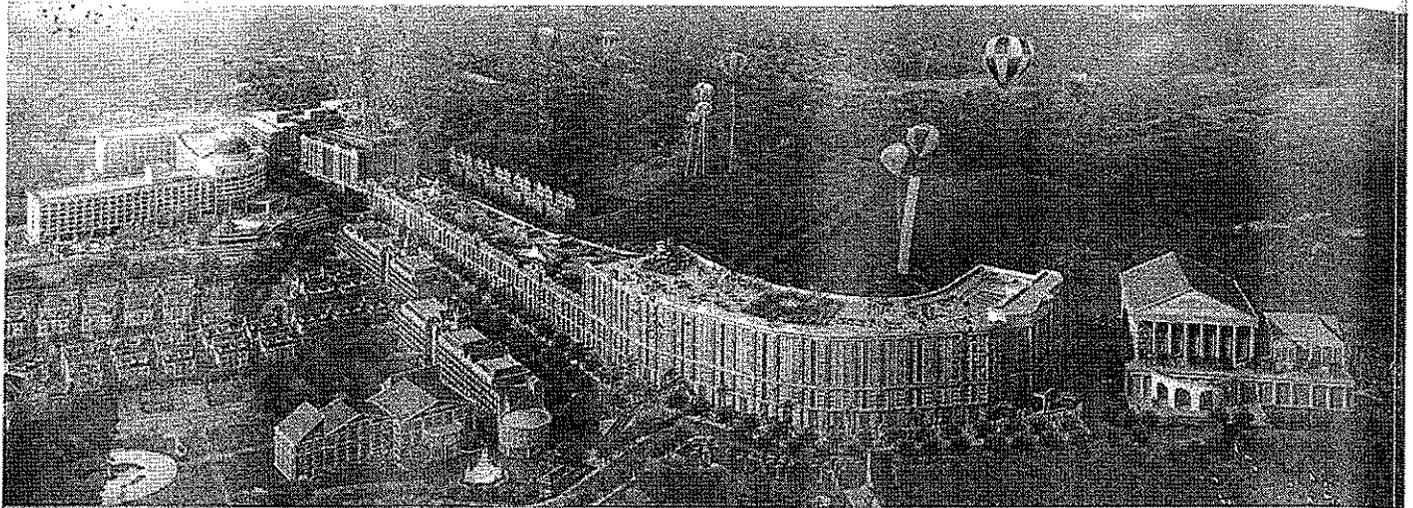
As the core member of the real estate and leisure business sector of the E-DA United Group, Eliter International Corporation was founded in 1998. The primary goal of the corporation is to develop the E-DA city to become a nationwide multifunctional district. The Planned Unit Development (PUD) method is employed to create a relaxed and serene living environment. Ultimately, the E-DA city will grow to be a spiritual resort which is full of academic, art and recreational atmosphere.

Locating in the renowned scenic resort in Kaohsiung County and neighboring the I-Shou University and the I-Shou International School, the E-DA city villas are born to be classic literary residences. The European and American townhouse styles set up a tone of privacy, leisure and freedom and make the E-DA city villa precious in its kind.





義大開發股份有限公司  
E-DA DEVELOPMENT CORP.



設立日期：中華民國82年9月

資本額：新台幣25億元

核心價值：致力商業地產開發、營造生活歡樂休閒空間

營業項目：休閒、娛樂、購物、餐飲及飯店等商業地產開發與經營

**Date of Establishment:** September, 1993

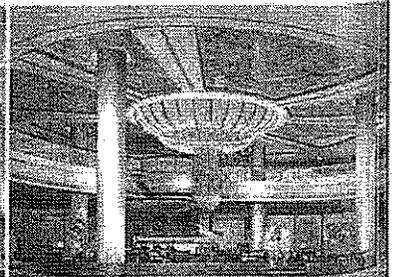
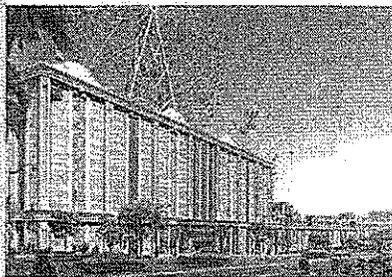
**Capital:** NT\$ 2,500million.

**Core Value:** Devoted to commercial real estate development and creating joyful relaxation space of life.

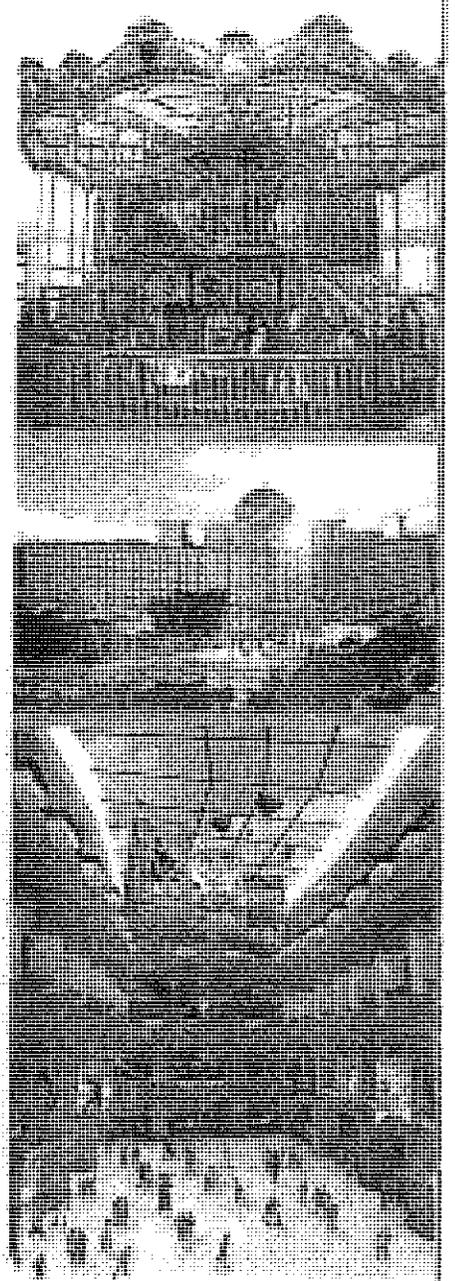
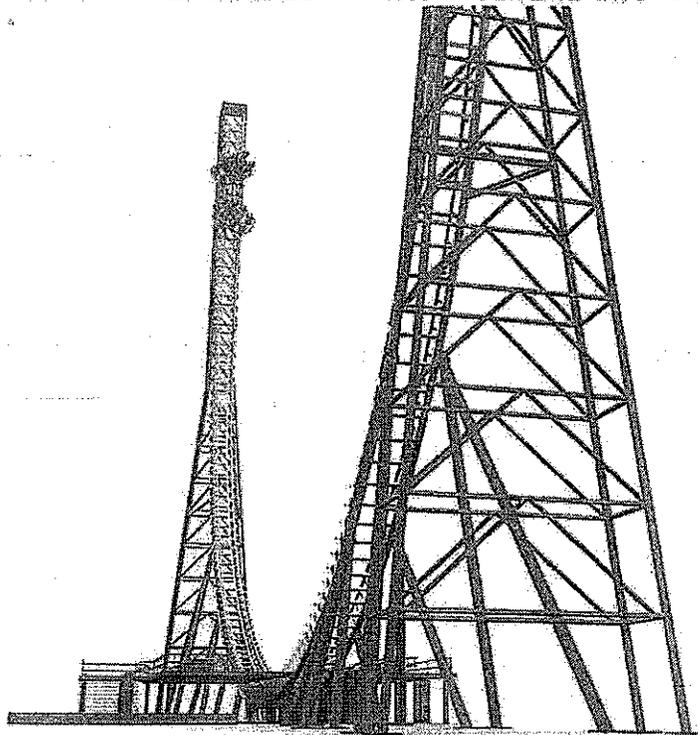
**Services:** Commercial development and operation of recreation, theme park, mall, restaurants and hotel properties.

Real Estate  
Developer

15 16



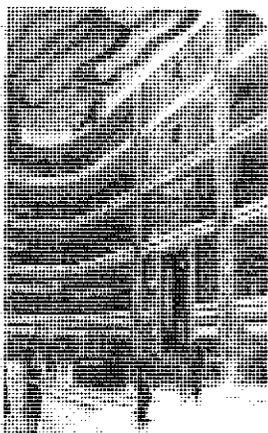
義大開發營業範圍包括休閒、娛樂、購物、餐飲、及飯店等商業綜合開發，為義聯集團地產及休閒事業體主要成員，並主導高雄縣觀音山義大城全區數百億元投資規模之國內最完整休閒造鎮計畫整體開發。目前義大開發公司正積極籌建義大城全區開發案中屬於國內首創國際級複合式休閒娛樂大型購物中心之「義大世界購物廣場」、國內最大室內主題樂園之「義大主題樂園」及約650間客房之全國最大五星級城市休閒渡假旅館「義大皇家酒店」；天悅溫泉休閒公司則持續推動屏東縣車城鄉四重溪溫泉公園民間投資開發案之「天悅溫泉飯店」，並將打造為台灣最具競爭力的觀光溫泉飯店。



E-Da Development Corp. (EDD) is one of the major members of the real estate and leisure business sector under E United Group. EDD provides services of relaxation, amusement, retail, restaurant and hotel.

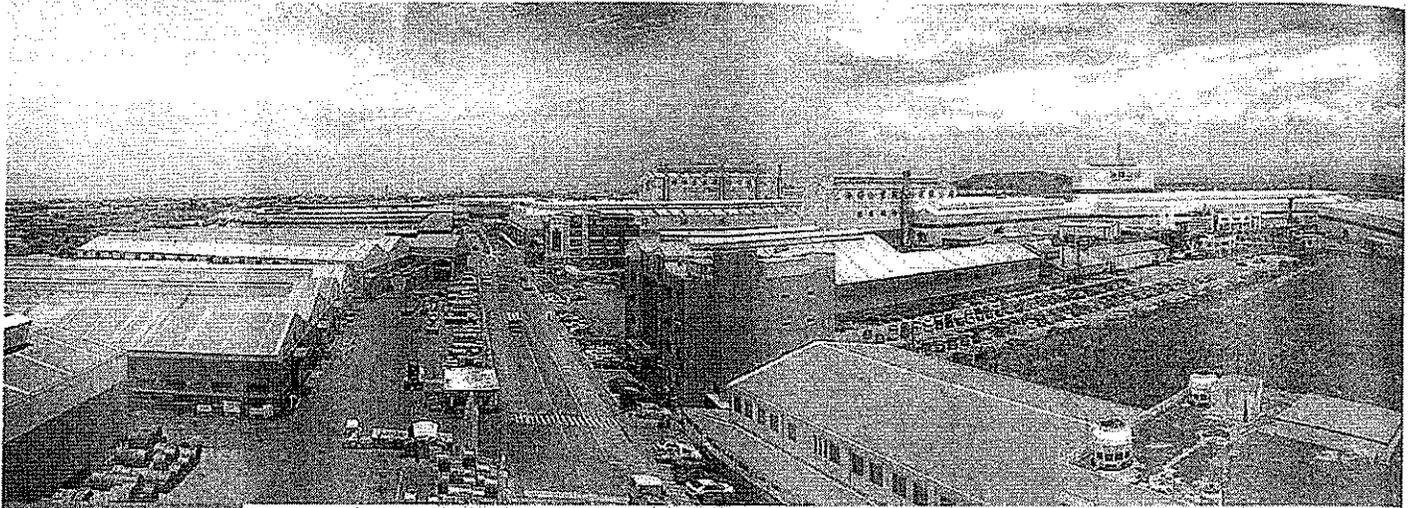
EDD plays the main role of developing the E-Da City Project in Mt. Guanyin, Kaohsiung County. The total investments of the E-Da City Project are estimated exceed tens of billions N.T. dollars and will be the most completed mass leisure business project in Taiwan. E-Da World Plaza and E-Da Theme Park are the major two projects under-developed by EDD. E-Da World Plaza is the first international scale recreation mall and E-Da Theme Park is the largest indoor theme park in Taiwan. E-Da Royal Hotel is the largest 5 star city-resort hotel (with nearly 650 guest rooms) in Taiwan.

In the meantime, Skylark Hot Spring Resort Hotel in Pingtung, a BOT project in association with County Government, is under progress by Tian-Yue Hot Spring & Resort International Corp. This hotel project will become the most popular hot spring resort in Taiwan.





**燿輝企業股份有限公司**  
YIEH PHUI ENTERPRISE CO., LTD.



設立日期：1986年3月

資本額：新台幣139億元

員工人數：約1,500人

產線：二條酸洗線、四座冷軋機、四條連續式熱浸鍍鋅線、  
三條連續式烤漆線、九條製管線

主要產品：酸洗鋼捲、冷軋鋼捲、熱浸鍍鋅/鍍5%鋁鋅/鍍55%鋁鋅  
鋼捲、彩塗烤漆鋼捲、鋼管、鋼構、運搬起重設備

**Date of Establishment :** March, 1986

**Capital :** NT \$ 13.9 billion

**Number of Employees :** 1,500

**Production Lines :** 2 pickling lines, 4 cold rolling mills,  
4 continuous hot-dip galvanizing lines,  
3 continuous pre-painting lines, 9 pipe-forming lines

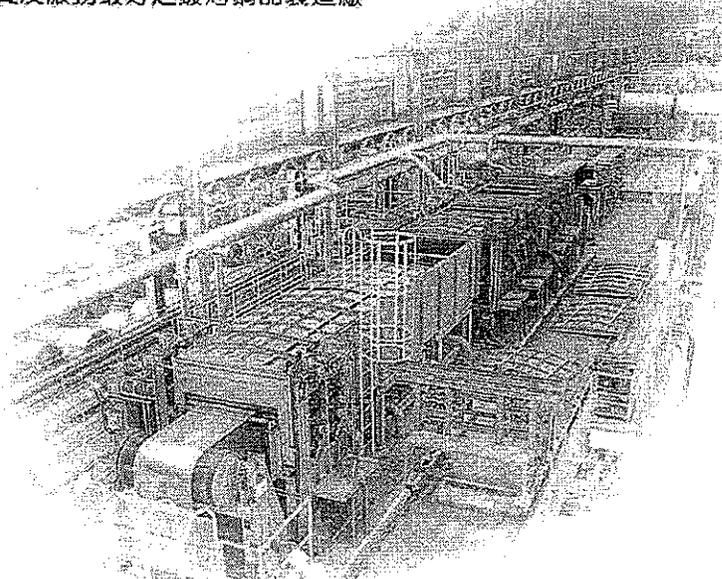
**Main Products :** Pickled Steel Coils, Cold Rolled Steel Coils,  
Hot-Dip Zinc / 5% / 55% Al-Zn Coated & Color Steel  
Sheets, Steel Pipes, Steel Structure, Material  
Handling Equipment

Manufacturing

17 18



燁輝企業於1986年設立，目前主要產線設置於橋頭廠區與屏東廠區，每年生產鍍鋅鋼捲130萬噸，烤漆鋼捲43萬噸，為台灣及東南亞地區最大的鍍烤鋼品專業製造廠，也是全世界產量最大的鍍烤廠，同時也是台灣最大鋼管製造廠，鋼管年產量可達12萬噸以上。燁輝公司除ISO 9001、ISO 14001、OHSAS 18001等管理系統認證外，也是全球鋼鐵業首家通過IECQ QC 080000 HSPM認證公司。燁輝公司自開始生產以來，歷經15年的擴建，雖然國內外市場競爭非常激烈，本著以創造利潤、精益求精及贏得信任的經營方針服務客戶，每年業績均能大幅成長。今後將在回饋社會之理念下，繼續降低成本及開發高附加價值之產品，成為不僅是產量最大亦是效率最高、品質及服務最好之鍍烤鋼品製造廠。



Established in 1986, Yieh Phui's major production lines operate in its Kaohsiung Works and Pingtung Works. The annual capacity is 1.3 million tons of

galvanized steel coils and 430,000 tons of pre-painted steel coils, which make Yieh Phui the largest specialized producer of coated steel in Southeast Asia, and the world's largest independent hot-dip galvanizer and coil coater. Furthermore, the company is the largest steel pipe manufacturer in Taiwan, capable of producing over 120,000 tons of steel pipes annually. Yieh Phui is not only registered by ISO 9001, ISO 14001 and OHSAS 18001, but the first company that acquires IECQ QC 080000 HSPM

approval among global steel industries. Since its establishment, Yieh Phui has experienced 15 years of continuous expansion. Regardless of the rigorous competition both in domestic and international markets, Yieh Phui has recorded significant growth in its sales each year. The company insists on its corporate mandate of profit creation, continuous improvement and building trust in serving its customers. With the vision to contribute to the society, Yieh Phui will continue to reduce its costs and develop high value-added products. Its objective is not only to become the largest, but also the most efficient galvanizer and to produce the best quality products.

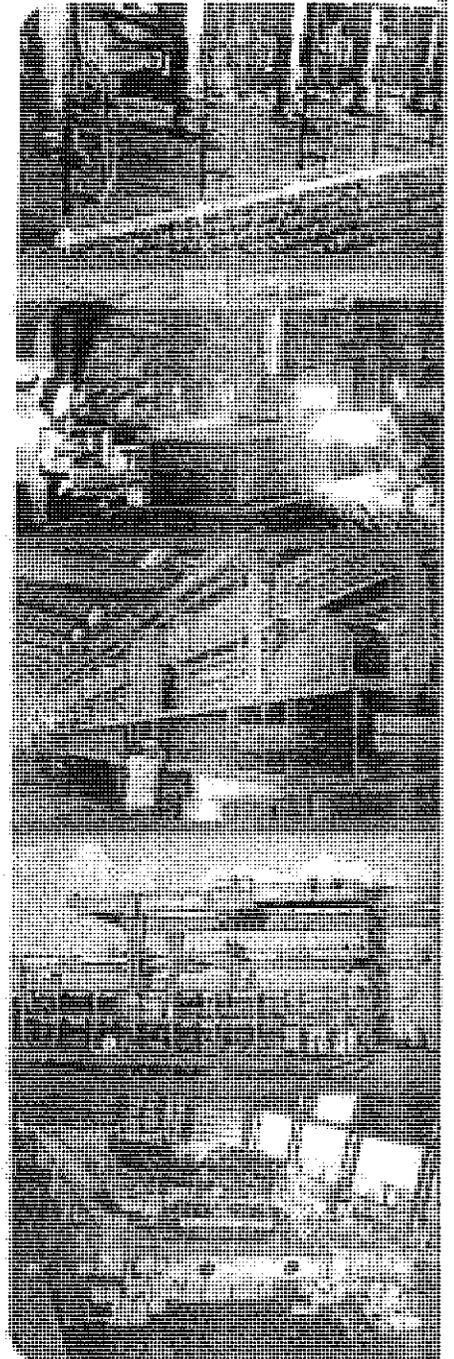
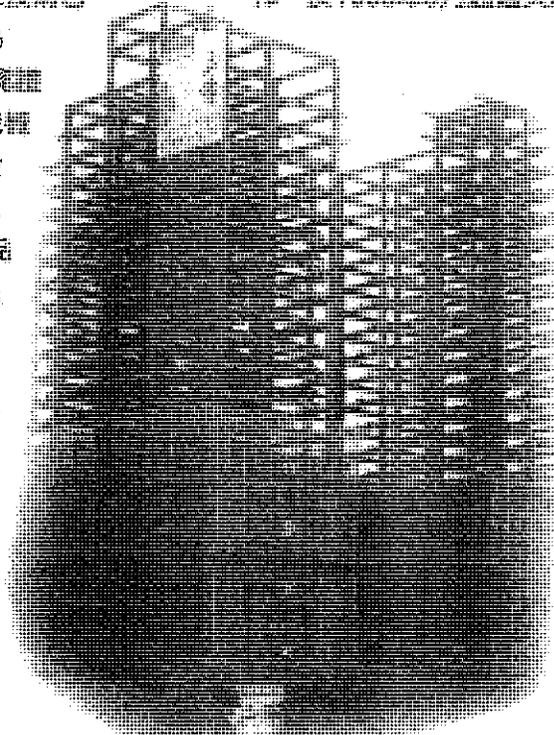


## 燁輝企業——工程事業部

燁輝企業工程事業部目前有兩個工廠，分別位於高雄縣路竹鄉與燕巢鄉，路竹廠為國內主要鋼構製造專業廠，擁有國內最新型式鋼組立(BH)生產線、全焊道全滲透製程之箱型柱(BOX)生產線、二次型料加工線及各式CNC泛用加工設備。為提升生產技術，與日本川崎重工技術合作，於1998年3月通過英國勞

氏驗船協會認證，成為ISO9001:2000合格認證

廠商。燕巢廠為運搬機器製造廠，擁有各式運搬起重設備製作能力，以「擎天牌AIRSTAR」品牌行銷全球，品質系統ISO9001:2000由SGS台灣檢驗科技認證合格，為目前台灣少數具有設計能力之最大起重機械專業製造廠。



Yieh Phui's Engineering Business Division has two production plants which are located at Luhtzu Township and Yanchao Township respectively. Luhtzu Plant focuses on steel structure production. The technology of fabricating steel structure was developed via the cooperation with Kawasaki Heavy Industries of Japan, which includes the state-of-the-art type of built-up H-beams and the well welded Box column with the goal of improving fabrication technique. Yanchao Plant has been approved as an ISO 9001:2000 registered firm by Lloyd's since March 1998. It is the largest material handling equipment manufacturer in Taiwan, whose production mainly focuses on design, manufacture and erection of diversified cranes, container cranes, and straddle carriers. "AIRSTAR" is the world famous brand for Yanchao plant's cranes. Its quality system is also approved to meet the standards of ISO 9001: 2000 by SGS Taiwan.



常熟啟揚新興建材有限公司

CHANGSHU CHIEF LEADING EDGE CONSTRUCTION MATERIALS CO., LTD.



設立日期：2001年4月  
位置：江蘇省常熟經濟開發區沿江工業區  
投資金額：約3千萬美元  
土地面積：13萬平方米  
員工人數：約300人  
營業項目：大樓鋼構、廠房鋼構設計、製造、安裝  
各類鋼品之剪裁、分條

**Date of Establishment:** April, 2001

**Location:** Riverside Industrial Park, Changshu Economic Development Zone, Jiangsu, China

**Initial Investment:** 30 Million USD

**Lot Area:** 130,000 m<sup>2</sup>

**Number of Employees:** 300

**Main Service:** Steel structure design, manufacturing and assembling for buildings and mills.  
Coil cutting, shearing and slitting.

常熟啟揚新興建材有限公司是於2001年4月由燁輝投資設立，位於江蘇省常熟經濟開發區沿江工業區，投資金額為3千萬美元，土地面積達13萬平方米，主要從事大樓鋼構、廠房鋼構設計、製造及安裝，另外尚包括各類鋼品之裁剪、分條等，年產量規模可達30萬噸。

Changshu Chief Leading Edge Construction Materials was invested by Yieh Phui in April 2001. It is located inside the Riverside Industrial Park Changshu Economic Development Zone, Jiangsu Province, China. The total investment has reached US\$30 million, and the plant occupies a land area of 130,000 square meters. The company is engaged mainly in design, manufacture and assembly of steel structure of buildings and mills. It also provides services for cutting, slitting and shearing of a variety of steel products, with an annual capacity of 300,000 tons.

Manufacturing



炸輝(中國)科技材料有限公司

YIEH PHUI CHINA TECHNOMATERIAL CO., LTD.



設立日期：2001年12月

位置：江蘇省常熟經濟開發區沿江工業區燁輝路1號

投資金額：約2.313億美元

土地面積：23萬平方米

員工人數：約900人

產線：一條酸洗線、二座冷軋線、二條連續熱浸鍍鋅線、  
二條連續鋼捲烤漆線（第三條熱浸鍍鋅線建設中）

主要產品：酸洗鋼捲、冷軋鋼捲、熱浸鍍鋅/鍍5%鋁鋅/鍍55%鋁鋅鋼捲  
、彩塗烤漆鋼捲

**Date of Establishment :** December, 2001

**Location :** 1, Yiehphui Road, Riverside Industrial Park, Changshu  
Economic Development Zone, Jiangsu, People's  
Republic of China

**Initial investment :** US \$ 231.3 million

**Lot Area :** 230,000m<sup>2</sup>

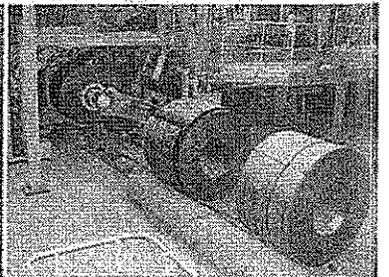
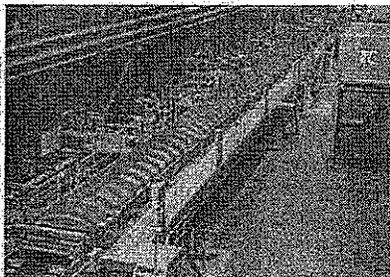
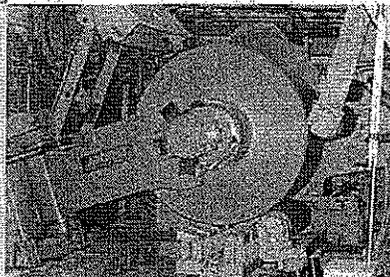
**Number of Employees :** 900

**Production Lines :** 1 Pickling Line, 2 Reversing Cold Rolling Mills, 2 Continuous  
Hot-Dip Galvanizing Lines, 2 Continuous Pre-Painting Lines  
(No. 3 Continuous Hot-Dip Galvanizer Line under construction)

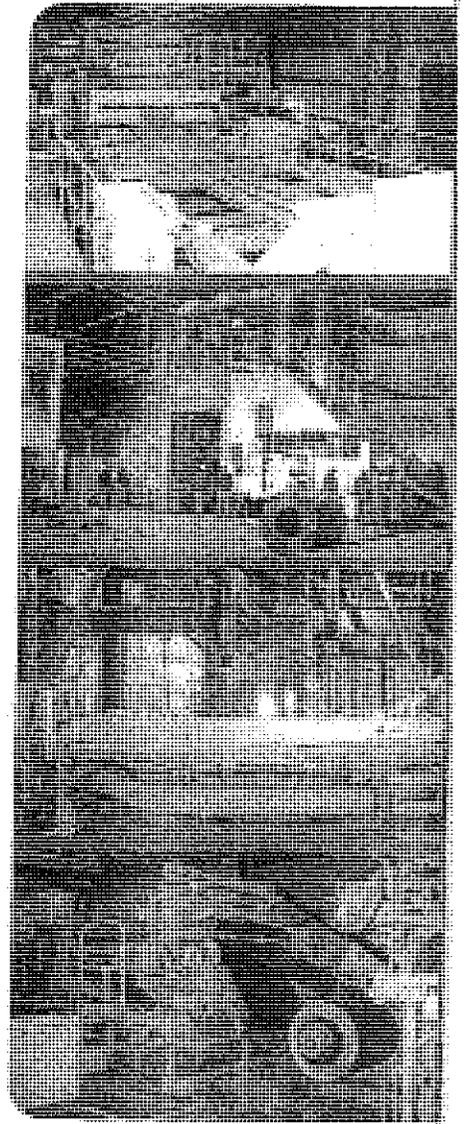
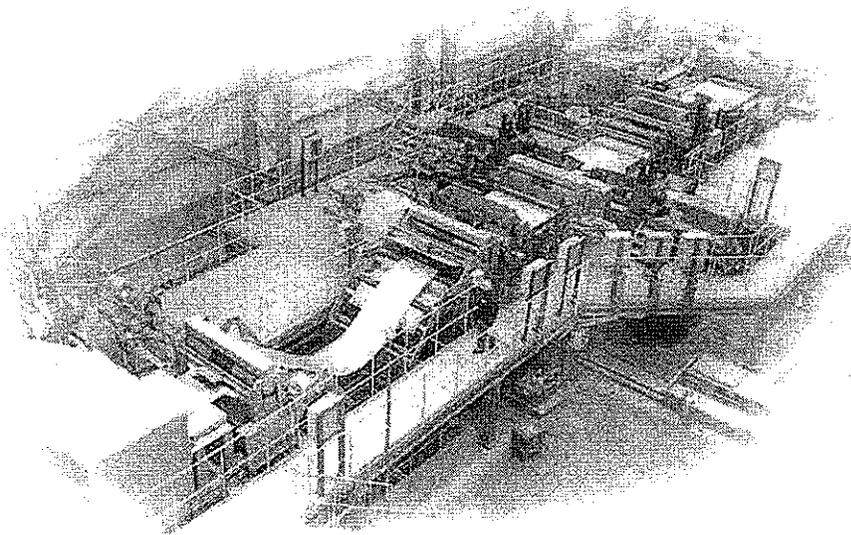
**Main Products :** Pickled Steel Coils, Cold Rolled Steel Coils, Hot-Dip  
Zinc / 5% / 55% Al-Zn Coated & Color Steel Sheets

生  
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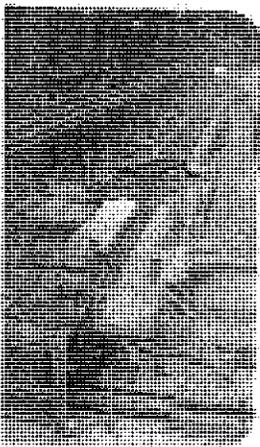


燁輝(中國)科技材料公司是於2001年由燁輝公司轉投資設立。其位置與常熟啓揚新興建材同在江蘇省常熟經濟開發區沿江工業區內，投資金額為2.313億美元，土地面積達23萬平方米，已先後完成一條酸洗線，二座冷軋機，二條連續熱浸鍍鋅線，二條連續鋼捲烤漆線，並正建設第三條連續熱浸鍍鋅線，全部建廠完成，每年可生產90萬噸之酸洗鋼捲、60萬噸之冷軋鋼捲、90萬噸熱浸鍍鋅鋼捲、以及烤漆鋼捲36萬噸。



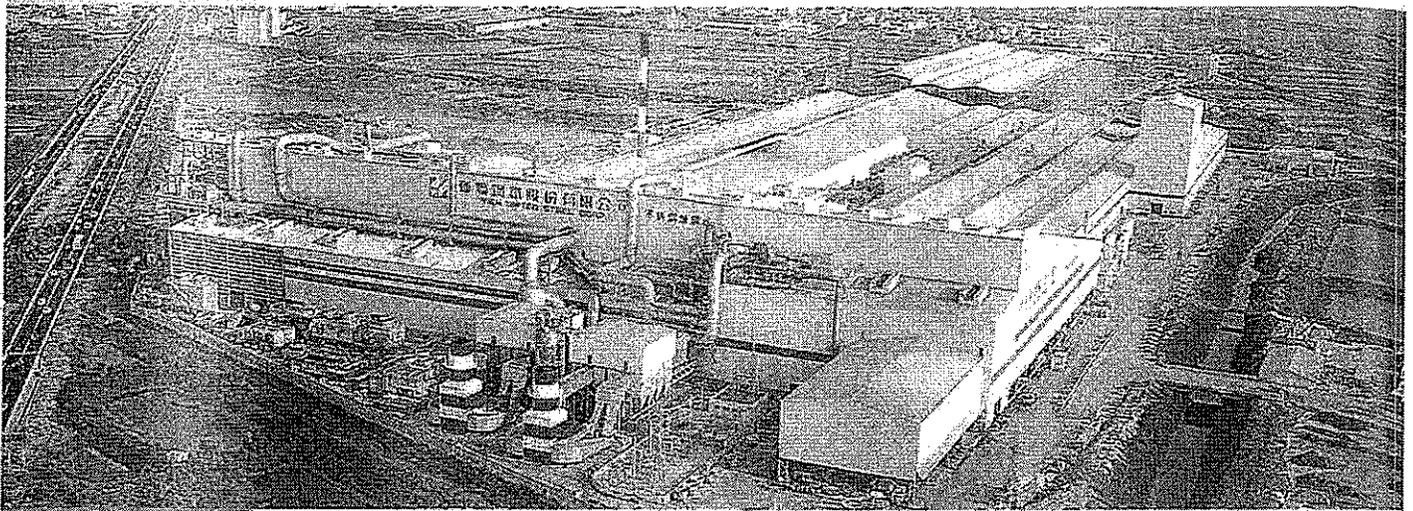
Established in 2001, Yieh Phui(China)Technomaterial is also invested by Yieh Phui. Same as Chief Leading, it is located in the Riverside

Industrial Park Changshu Economic Development Zone, Jiangsu Province, China. The total investment is about US\$231.3 million, and the plant occupies a land area of 230,000 square meters. One pickling line, two cold rolling mills, two continuous hot-dip galvanizing lines and two continuous pre-painted lines have been commissioned. Currently the third continuous hot-dip galvanizing line is under construction. Once the construction of the entire plant is completed, its annual capacity is expected to reach 900,000 tons of pickled steel coils, 600,000 tons of cold rolled steel coils, 900,000 tons of hot-dip galvanized steel coils, and 360,000 tons of pre-painted steel coils.





燁聯鋼鐵股份有限公司  
YIEH UNITED STEEL CORP.



設立日期：中華民國77年12月

資本額：新台幣166.3億元

員工人數：約2,100人

產線：一貫作業不銹鋼廠，含煉鋼、熱軋、冷軋

主要產品：熱軋不銹鋼黑皮鋼捲、熱軋不銹鋼NO.1鋼捲、  
冷軋不銹鋼鋼捲

**Date of Establishment :** December, 1988

**Capital :** NT\$16.63 billion

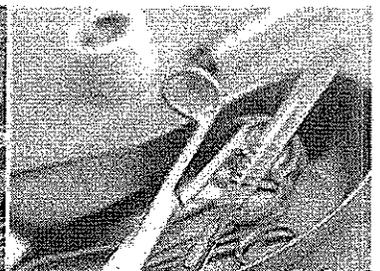
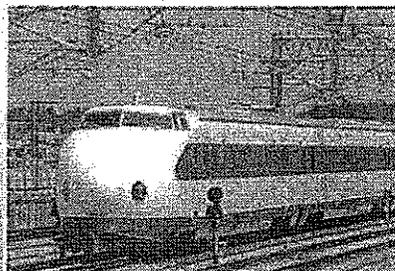
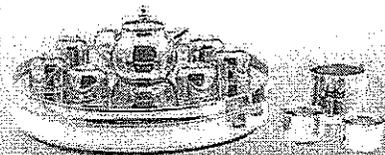
**Number of Employees :** 2,100

**Production Lines :** Integrated manufacturing processes including  
steel making, hot rolling and cold rolling

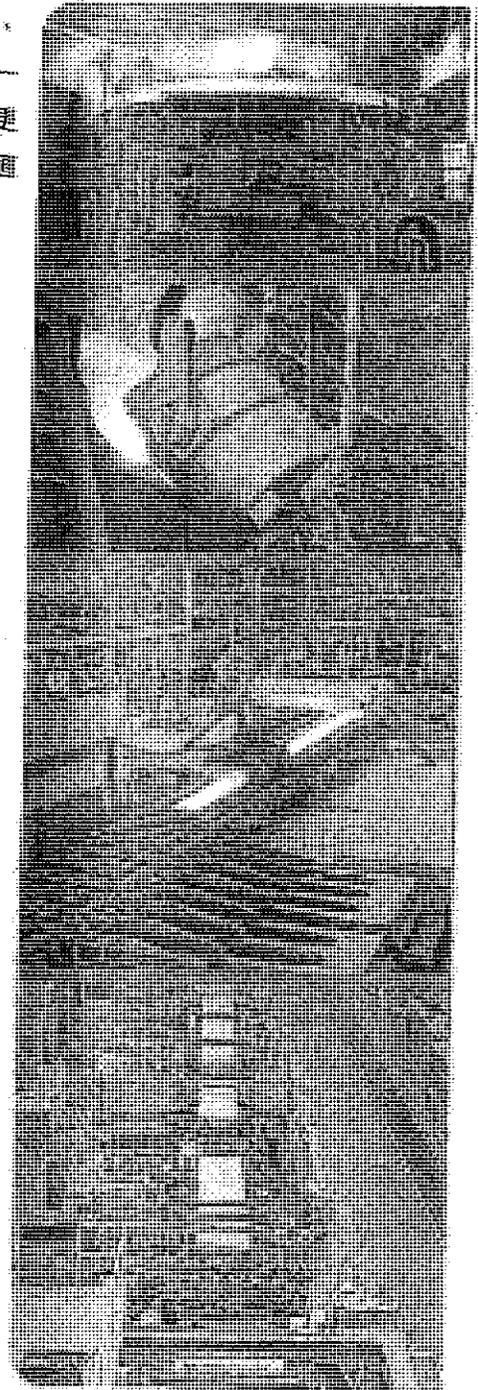
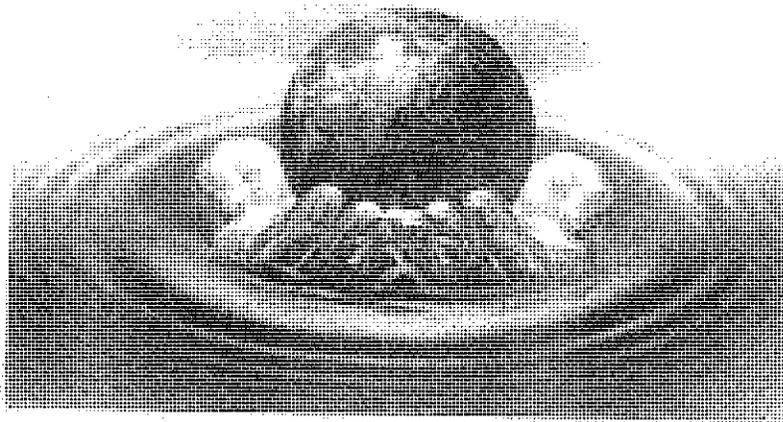
**Main Products :** Stainless Black HRC, Stainless No.1 HRC,  
Stainless-CRC

Manufacturing

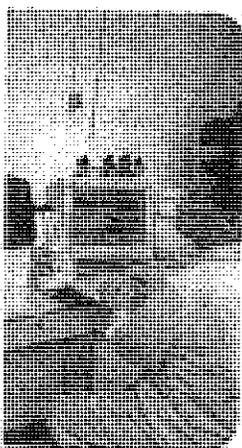
23 24



燁聯鋼鐵為台灣唯一擁有煉鋼、熱軋、冷軋完整製程的一貫作業不銹鋼廠，總投資金額超過新台幣400億元，在全體員工的努力耕耘下，煉鋼年產量已超越百萬噸，熱軋與冷軋年產量分別已突破50萬噸及60萬噸，並已通過ISO9001品質、14001環境及OHSAS18001職業安全衛生等多項管理系統認證。燁聯是不銹鋼的製造業者，更是不銹鋼的服務業者，因此，自成立以來，除了產量的不斷提升外，更秉持著以顧客為導向，並以建構一「更大、更快、更好」之國際專業不銹鋼廠為發展策略，以更快的交期、更快的服務及更好的品質，提供下游客戶更好的服務，期能提升公司整體價值創造競爭優勢。



**Y**USCO is the one and only integrated stainless steel producer in Taiwan. The company invest over NT\$40 billion. There are currently more than 2,100 employees serving in YUSCO, contributing to a annual capacity of over 1 million tons of steel making, 950,000 tons of hot rolling, and 600,000 tons of cold rolling. YUSCO is proud to be certified with ISO9001 for the quality management, 14001 for the environmental management and OHSAS18001 for the occupational safety and health management. YUSCO is not only a manufacturer of stainless steel, but also a service provider. Since its establishment, it not only works hard to maximize its output, but also strives to provide a customer oriented services. YUSCO's vision is to be a "larger, faster and better" international specialized stainless steel manufacturer, which means to provide clients with faster delivery, better services and higher quality. YUSCO is expected to march forward with recognized overall value and competitive advantages.





燁興企業股份有限公司

YIEH HSING ENTERPRISE CO., LTD.



設立日期：中華民國67年7月

資本額：新台幣73億元

員工人數：約277人

產線：軋延線、固溶化、酸洗線

主要產品：各類線材盤元-包括不銹鋼、碳鋼、合金鋼、快削鋼  
不銹鋼管之製造及銷售

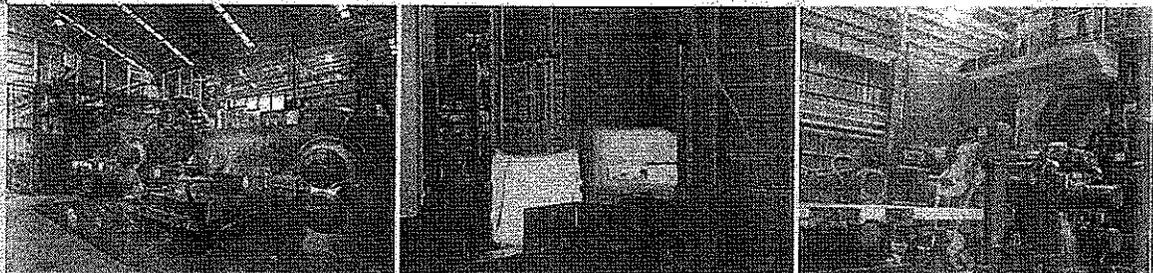
**Date of Establishment :** July, 1978

**Capital :** NT\$ 7.3 billion

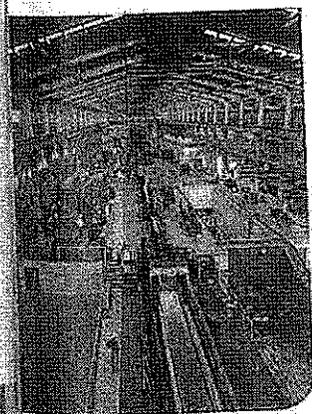
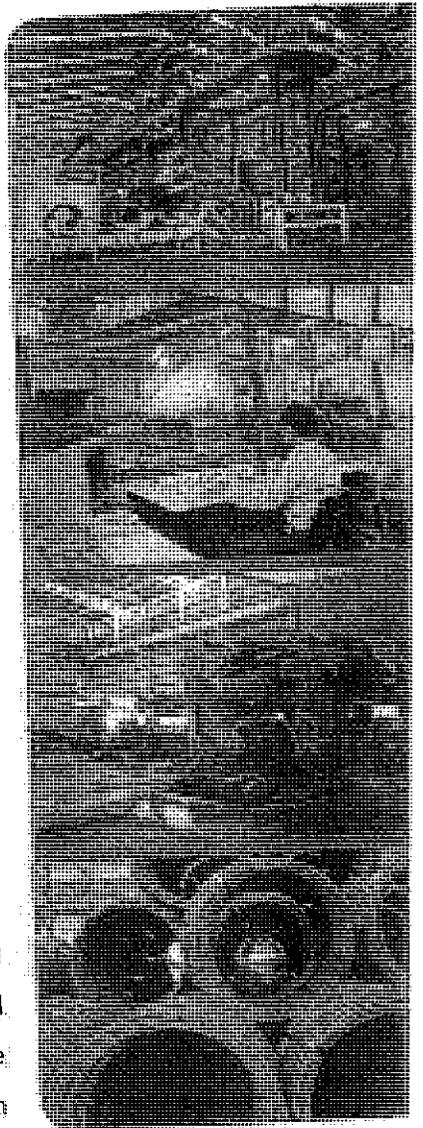
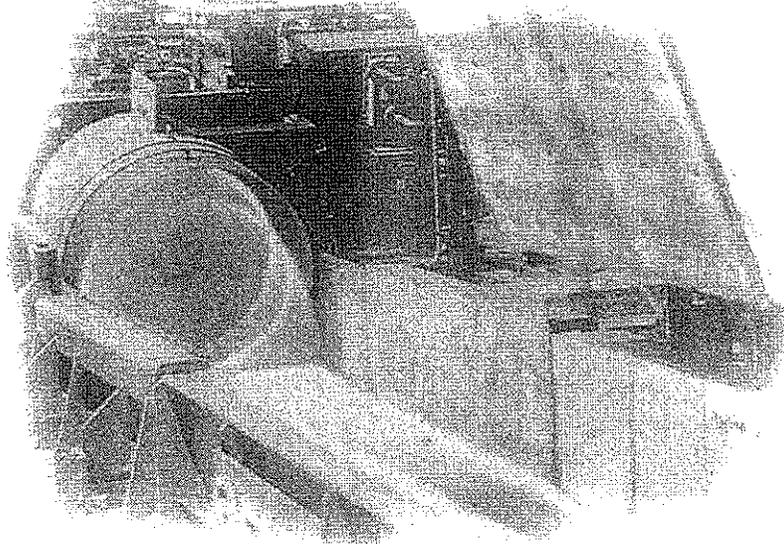
**Number of Employees :** 277

**Production Lines :** Rolling Mill, Solution Annealing, Pickling Line

**Main Products :** Stainless Steel Wire Rod, Carbon Steel Wire Rod,  
Free Cutting Steel Wire Rod, Alloy Steel Wire Rod



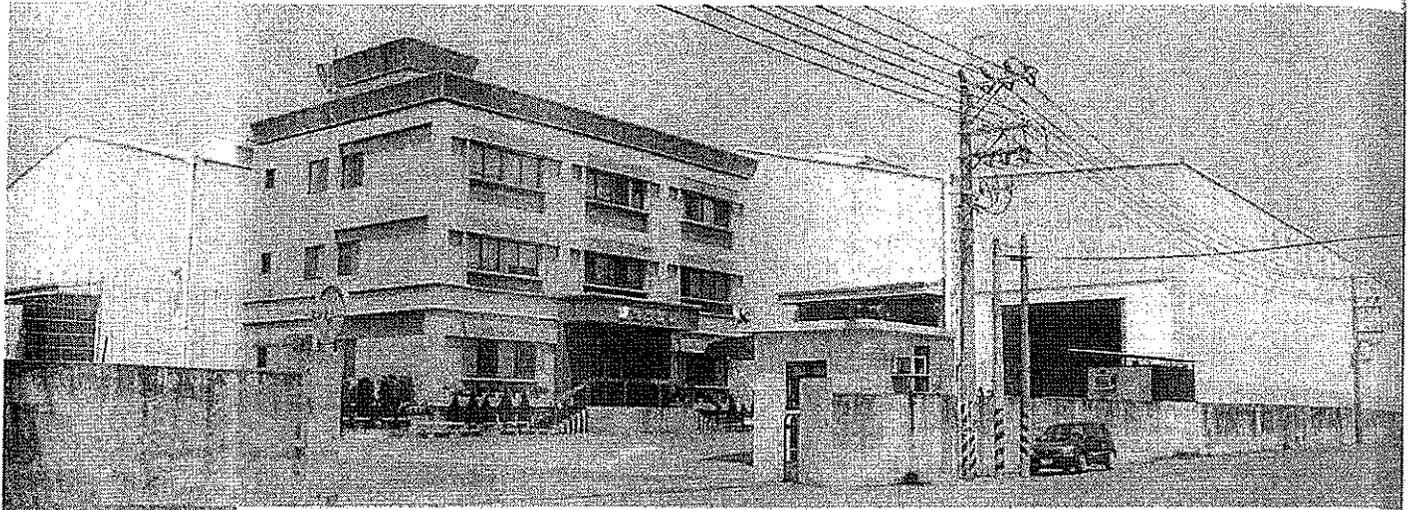
燁興公司為義聯集團於民國67年7月創立之第一家公司，創立初期以碳鋼、鍍鋅鋼管為主要產品，民國80年加入岡山線材廠，民國86年加入屏南線材廠，目前主要產品為各類線材盤元，包括不銹鋼、碳鋼、合金鋼、快削鋼，年產能約200,000噸，為國內少數可完整提供各鋼種、尺寸盤元之大廠；供應下游客戶製成各式螺絲、螺帽及各項工業產品、電子產品及航太等基礎零件。燁興公司擁有完整的檢驗設備，並通過ISO 9001品質認證，確保所生產產品符合國際標準及客戶需求。成立之初燁興即以快速回應客戶需求、快速交貨、快速反應市場資訊之三快服務客戶，未來亦將秉持著相同精神提供客戶所需，並期望能持續發展成為最專業、最具競爭力的線材專業生產廠商。



*Y*ieh Hsing is the first company of E United Group. Yieh Hsing started as a steel producer in carbon steel tube and pipe. In 1992, Yieh Hsing commissioned its first SMS wire rod line as well as production and sales of stainless steel wire rod, carbon steel wire rod, free cutting steel wire rod and alloy steel wire rod which made it one of the most professional manufacturers in Taiwan, now. Our products are available for various application for downstream customers, such as nuts screw wires, automobile parts, machine parts hardware and tools etc. In order to meet customers' requirement, Yieh Hsing sets up a complete quality control system. We are also awarded the ISO 9001 certificate. Yieh Hsing established 3Qs in its service policy to ensure customer satisfaction: Quick response, Quick delivery, Quick reaction. Yieh Hsing's vision lies in continuous advancement, and to become a renowned professional steel producer.



輝茂實業股份有限公司  
YIEH MAU CORP.



設立日期：中華民國77年3月

資本額：新台幣16.2億元

員工人數：約105人

產線設備：分條機、整平及裁板機、拋砂研磨機、鏡面研磨機

主要產品：不銹鋼不同表面之加工生產、鋼鐵貿易及銷售

集合住宅、辦公室之投資興建、銷售。

**Date of Establishment:** March, 1988

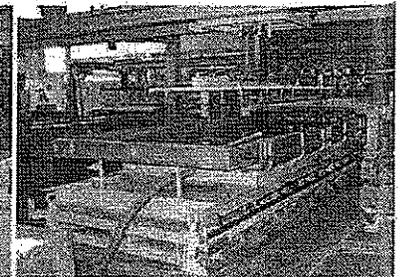
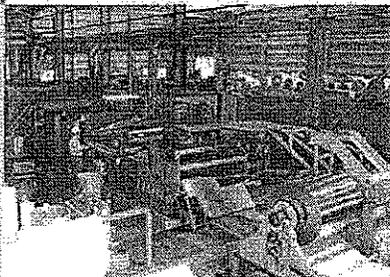
**Capital:** NT\$ 1.62 billion

**Number of Employees:** 105

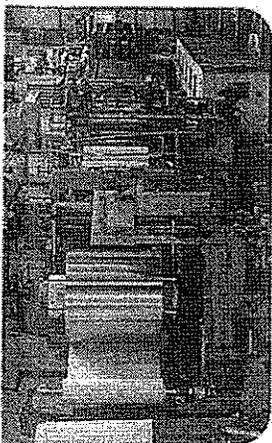
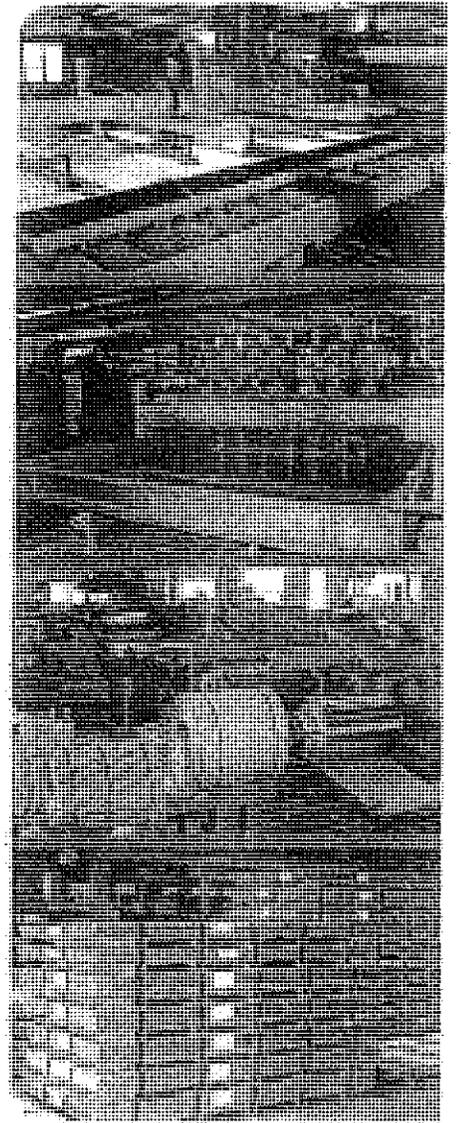
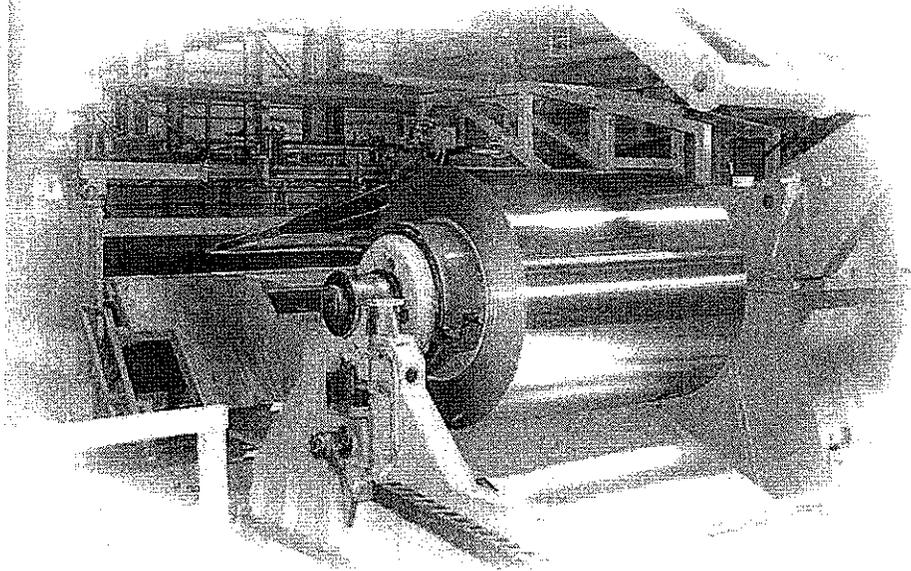
**Production Facilities:** Slitting Line/ Leveling and Cut to Length Line/  
Grinding And Polishing Line/ Mirror Finishing

**Product and Service:** Steel Products Trading, Production and sales of  
Stainless Steel, Alloy Steel and specialty Steel.

Manufacturing



燁茂實業初期從事鋼品之進出口貿易及國內銷售，扮演集團內貿易商角色。1994年起，轉入製造業，生產及銷售不銹鋼、合金鋼等特殊鋼線材，但仍維持原鋼鐵貿易商功能，其中貿易及製造業約佔一半。並於1996年起，朝不銹鋼下游加工業發展。目前高雄路竹廠已開始生產，產品含鏡面、髮絲不銹鋼捲板等。2008年起將陸續引進厚板裁剪設備，將成為不銹鋼中間製品之主力供應商。

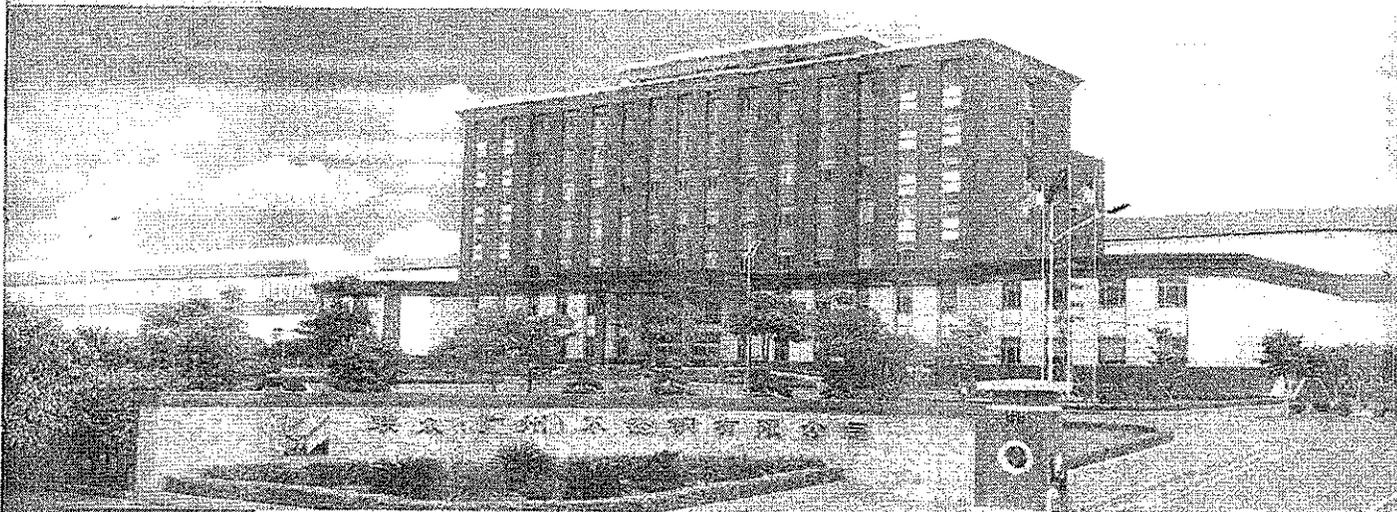


*Y*ieh Mau corporation (YM) act as a trading house for all the metal products. In 1994, YM constructed a stainless steel wire rod processing plant to expand business scope to the manufacturing field with an annual sales volume up to NTD 5 billion level. From 1996, a new plant started to produce high value added stainless steel surface treatment products. The cut to length business of hot rolled stainless will be launched in 2008. YM is a key provider with wide range of stainless steel in flat in global market.



联众(广州)不锈钢有限公司

LIANZHONG STAINLESS STEEL CORPORATION



設立日期：2001年12月

位置：廣州經濟技術開發區東區

投資金額：約8億美元

土地面積：120萬平方米

員工人數：約2500人

產線：煉鋼、熱軋、冷軋一貫作業不銹鋼廠

最終產品：不銹鋼扁鋼胚、不銹鋼鋼板、熱軋不銹鋼黑皮鋼卷、  
熱軋不銹鋼白皮鋼卷和冷軋不銹鋼鋼卷

**Date of Establishment:** December, 2001

**Location:** Economy and Technology Development Zone, Gungzhou, China

**Initial Investment:** 800 million USD

**Lot Area:** 1.2 million m<sup>2</sup>

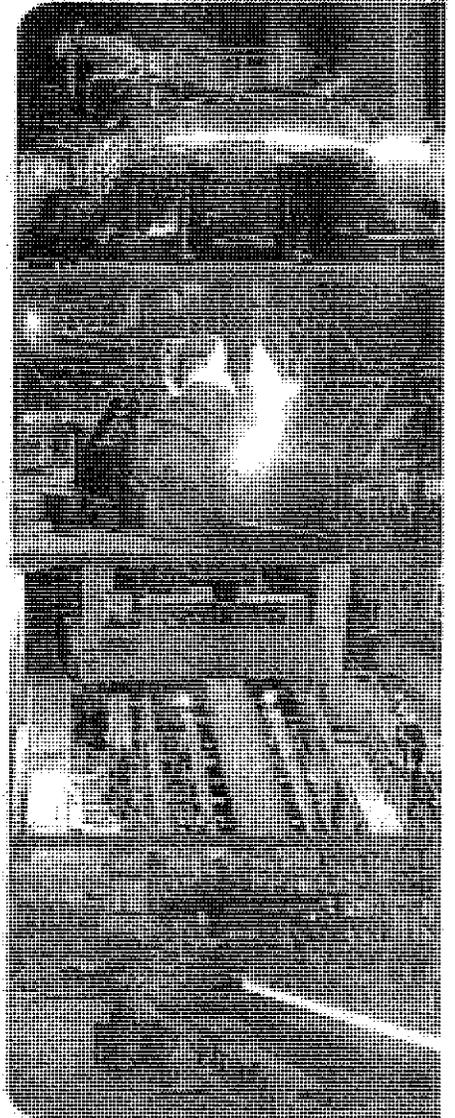
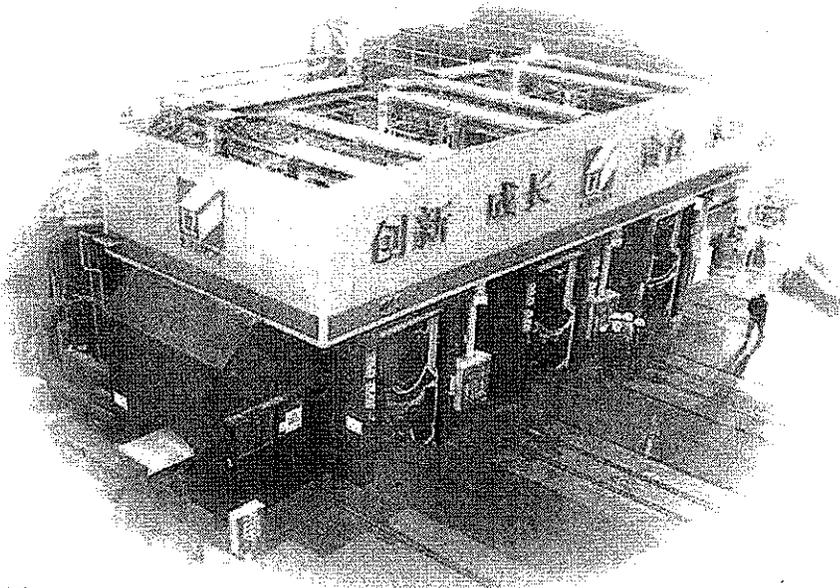
**Number of Employees:** 2500

**Production Lines:** Integrated manufacturing processes including steel making,  
hot rolling and cold rolling

**Main Products:** Stainless slab, Stainless plate, Stainless black hot rolled coil,  
Stainless No.1 hot rolled coil, Stainless cold rolled coil

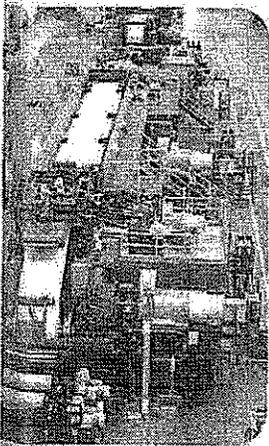


聯衆(廣州)不銹鋼有限公司為中國華南地區第一家擁有煉鋼、熱軋、冷軋完整製程的一貫作業不銹鋼廠和最大的專業不銹鋼生產基地，由燁聯公司轉投資設立，其設備、工藝及技術均達到世界先進的水平，具有世界上第一條連續式軋延、退火、酸洗、冷軋不銹鋼產線，以及目前大陸地區唯一可以生產10mm厚熱軋不銹鋼捲的熱軋退火酸洗線。同時在建設規劃之初即優先考慮能源的利用效率和生態環境的保護，採用了世界最先進的各式防治污染設備，以善盡維護社會資源的責任。聯衆公司已通過了ISO9001、ISO14001、OHSAS18001、PED、ISO17025等多項管理體系和產品國際認證，將以發展為世界頂尖不銹鋼專業製造企業為目標，努力建設具有國際競爭力的示範性不銹鋼大廠。



Lianzhong (Guangzhou) Stainless Steel Corporation (Lisco), designed with steel melting, slab casting, hot rolling, cold rolling, is the first and

largest professional integrated stainless steel manufacturer in the Southern China. Invested by YUSCO, its technology is acknowledged as the most advanced in the world. WRAPL is the first continuous cold rolled annealing pickling line in the world and HAPL is the only line that can process 10 mm-thick coils in Mainland China. From the beginning of construction, Lisco adopted the most advanced facilities for efficient utilization of energy and ecological environmental protection. Lisco has been approved as ISO9001, ISO14001, OHSAS18001, PED, and ISO17025 by Det Norske Veritas(DNV). With the vision to be a top stainless steel manufacturer in the world, Lisco works hard for being a model of competitive stainless steel manufacturer.



未來  
展望

Prospects

Medical Services & Health Care

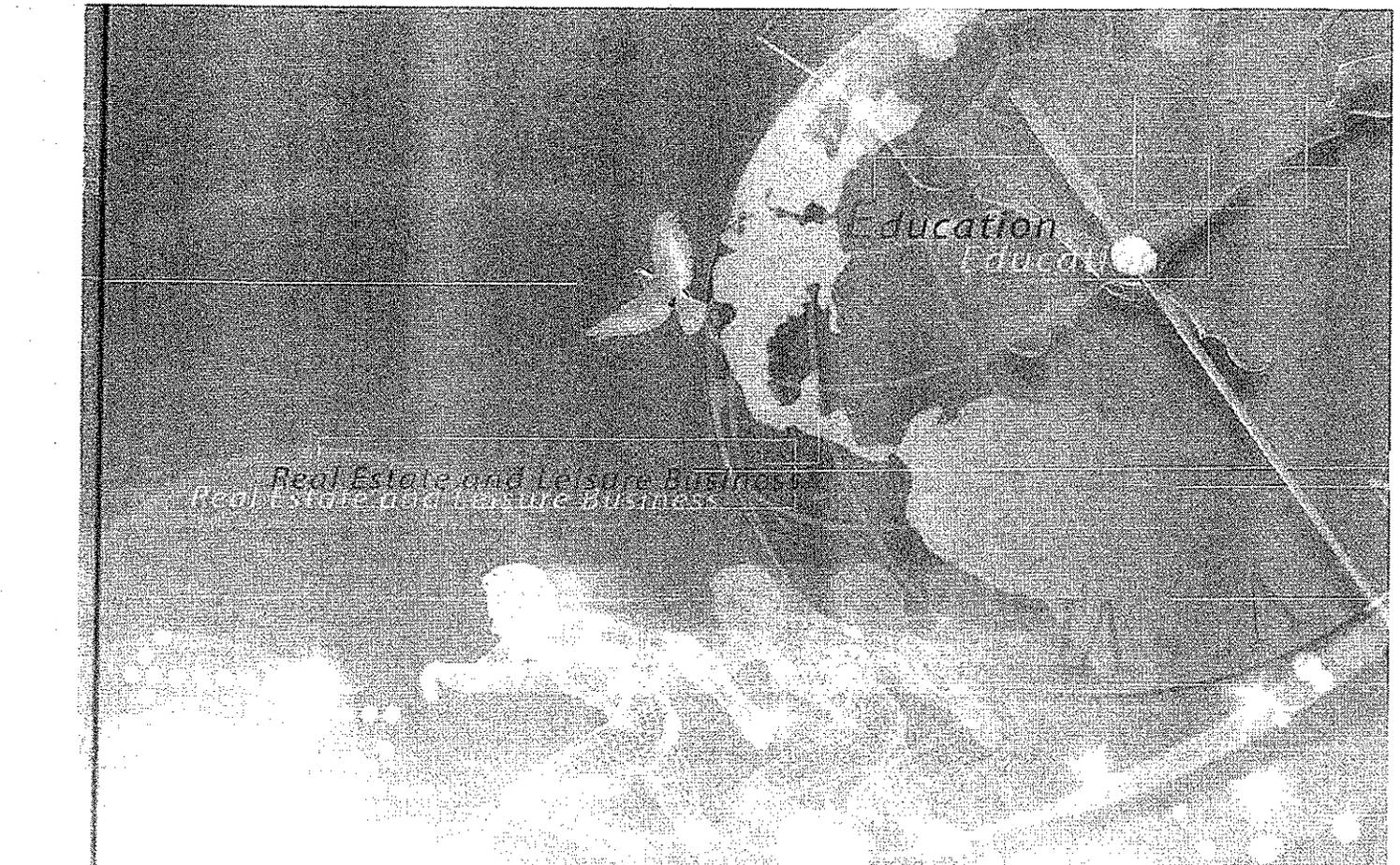
Manufacturing

不斷的創新與成長，是企業永續經營的動力。展望未來，在生產事業體系，除了繼續增強核心產品之競爭力外，「立足台灣、全球佈局」更是未來重要的營運方針。在教育體系方面，在現有的基礎上，期許能兼顧人本與科技的教育宗旨，滿足學生在專業知識的追求，積極與全球知名大學合作，期盼培養具宏觀的優秀人才，並以設立醫學院為目標，朝具國際水準之綜合大學發展。

在醫療體系，除了持續引進全球頂尖的儀器和設備外，未來將朝醫學中心及高品質醫療照護發展，並成立六大醫療中心，以仁心與堅實的醫療團隊來服務民眾。

在地產及休閒方面，積極進行觀音山大學城整體開發計畫，創造大高雄地區獨具風格、休閒、娛樂、購物與人文的觀光地標，以提升南台灣民眾的生活品質。

義聯集團已歷經多次不景氣循環的考驗，也深切體會唯有建構精實的營運體系，不斷的創新與發展，才能讓事業永續經營，以善盡企業的責任，樹立企業在社會中的價值。



*Education*  
*Education*

*Real Estate and Leisure Business*  
*Real Estate and Leisure Business*

Constant innovation and growth is impetus for business continuity. Looking to the future, by securing a foothold in Taiwan, while maintaining a global perspective, is the major operating policy of the manufacturing sector as well as continuing to improve the competitiveness of our core products.

For the education sector, we expect to build on the existing foundation and satisfy students' pursuit of professional knowledge in both the areas of humanities and technology. We will actively seek collaboration with renowned universities throughout the world, in order to provide training across a broad collection of disciplines. Our goal is to establish a medical school in ISU and develop it towards the direction of an international university.

For the medical services and health care sector, apart from introducing state-of-the-art equipment and facilities from all over the world, the hospital expects to develop itself into a well respected research facility and health care center. The company also wishes to establish six therapy centers, each serving the public with a kind hearted and skilled medical teams.

For the real estate and leisure business sector, the main projects currently underway include the E-Da Community at Guan-Yin Mountain. These projects will create a tourist landmark with unique style, recreational, theme park, mall and humanistic features in the entire Kaohsiung region. Each subsequently enhancing the quality of life among citizens of southern Taiwan.

E United Group has withstood many economic downturns and developed a profound understanding of the qualities required for long term business growth and prosperity, namely, development of operational strength and continual innovation and development.



五洲圖書

五洲圖書公司總經理部

30008 上海福州路 450 號

電話：800 700 1111

傳真：800 700 1222

http://www.wuzhou.com.cn

# Exhibit 2

**Yieh Phui's affiliates**

| # | Company | Company | Country of Incorporation/Establishment | Yieh Phui's Direct Shareholding | Yieh Phui's Direct and Indirect Shareholding | Affiliation | a | b | C | Board Members/Manager (Chinese) | Board Members/Manager (English) | Representative | Representative | Controlled by Mr. Lin or his family members | Business Operations | Involved in the Production/sales of the Goods Under Consideration during the Investigation Period? |
|---|---------|---------|--|---------------------------------|--|-------------|---|---|---|---------------------------------|---------------------------------|----------------|----------------|---|---------------------|--|
| 1 |         |         |  |                                 |  |             |   |   |   |                                 |                                 |                |                |   |                     |  |
| 2 |         |         |  |                                 |  |             |   |   |   |                                 |                                 |                |                |   |                     |  |
| 3 |         |         |  |                                 |  |             |   |   |   |                                 |                                 |                |                |   |                     |  |
| 4 |         |         |  |                                 |  |             |   |   |   |                                 |                                 |                |                |   |                     |  |
| 5 |         |         |  |                                 |  |             |   |   |   |                                 |                                 |                |                |   |                     |  |
| 6 |         |         |  |                                 |  |             |   |   |   |                                 |                                 |                |                |   |                     |  |
| 7 |         |         |  |                                 |  |             |   |   |   |                                 |                                 |                |                |   |                     |  |
| 8 |         |         |  |                                 |  |             |   |   |   |                                 |                                 |                |                |   |                     |  |
| 9 |         |         |  |                                 |  |             |   |   |   |                                 |                                 |                |                |   |                     |  |





































# Exhibit 3

Australian Standard<sup>®</sup>

**Continuous hot-dip metallic coated steel  
sheet and strip—Coatings of zinc and  
zinc alloyed with aluminium and  
magnesium**

Originated as part of AS A20—1934.  
Previous edition AS 1397—2001.  
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## PREFACE

This Standard was prepared by the Australian members of Joint Standards Australia/Standards New Zealand Committee MT-001, Iron and Steel, to supersede AS 1397—2001, *Steel sheet and strip—Hot-dipped zinc-coated or aluminium/zinc-coated*.

After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

This Standard upgrades the requirements of AS 1397—2001 and introduces three new coating types:

- (a) Zinc and aluminium (Type ZA).
- (b) Zinc, aluminium and magnesium (Type ZM).
- (c) Aluminium, zinc and magnesium (Type AM).

Committee MT-001 has sought to align with the following international and national Standards, where applicable:

ISO 9364:2006, *Continuous hot-dip aluminium/zinc-coated steel sheet of commercial, drawing and structural qualities*

ISO 4998:2011, *Continuous hot-dip zinc-coated carbon steel sheet of structural quality*

ISO 3575:2011, *Continuous hot-dip zinc-coated carbon steel sheet of commercial and drawing qualities*

ASTM A1046/A1046M-10a, *Specification for steel sheet, zinc-aluminium-magnesium alloy-coated by the hot-dip process*

ASTM A902-09, *Terminology relating to metallic coated steel products*

ASTM A875/875M-09a, *Specification for steel sheet, zinc-5% aluminium alloy-coated by the hot-dip process*

The terms 'normative' and 'informative' have been used in this Standard to define the application of the appendix to which they apply. A 'normative' appendix is an integral part of a Standard, whereas an 'informative' appendix is only for information and guidance.

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## STANDARDS AUSTRALIA

## Australian Standard

**Continuous hot-dip metallic coated steel sheet and strip—Coatings of zinc and zinc alloyed with aluminium and magnesium**

## SECTION 1 SCOPE AND GENERAL

**1.1 SCOPE**

This Standard specifies requirements for continuously hot-dip metallic coated sheet steel and strip supplied in thicknesses up to and including 5.0 mm.

Requirements for product conformity to this Standard are given in Appendix B.

Requirements covered in this Standard are as follows:

- (a) Formability grades of steel.
- (b) Structural grades of steel.
- (c) Classes of zinc coating, including differential coatings.
- (d) Classes of zinc coating converted to zinc/iron alloy.
- (e) Classes of zinc/aluminium coatings.
- (f) Classes of zinc/aluminium/magnesium alloy coating.
- (g) Classes of aluminium/zinc alloy coating.
- (h) Classes of aluminium/zinc/magnesium alloy coating.
- (i) Surface finish.

## NOTES:

- 1 Advice and recommendations on information to be supplied by the purchaser at the time of enquiry or order are contained in Appendix A.
- 2 The specified requirements apply to the full length and full width of the product supplied, unless otherwise indicated.
- 3 Within the description of the classes of coatings, the majority element present is listed first, followed by the next major element and followed by a third element if appropriate.

**1.2 NORMATIVE DOCUMENTS**

The following are the normative documents referenced in this Standard:

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

|          |   |
|----------|---|
| AS       |   |
| 1391     | Metallic materials—Tensile testing of ambient temperature   |
| 2331     | Methods of test for metallic and related coatings   |
| 2331.2.1 | Method 2.1: Tests for average coating mass per unit area or for thickness<br>Dissolution methods—Strip and weigh and analytical |
| 2331.2.3 | Method 2.3: Tests for average coating mass per unit area or for thickness—<br>Hydrogen evolution method for zinc coatings       |
| 2505     | Metallic materials  |
| 2505.1   | Part 1: Sheet, strip and plate—Bend tests   |

|        |  |
|--------|--|
| AS/NZS |  |
| 1050   | Methods for the analysis of iron and steel (all parts)                                     |
| 1365   | Tolerances for flat-rolled steel products  |
| ASTM   |  |
| A754   | Test method for coating weight (mass) of metallic coatings on steel by X-ray fluorescence. |
| ISO    |  |
| 7966   | Acceptance control charts  |

### 1.3 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

#### 1.3.1 Batch

An identifiable amount of 50 t or less of one product type, i.e. of a particular thickness of steel grade, coating type and coating mass, processed sequentially under similar conditions.

#### 1.3.2 Coating mass

The total mass of coating on both surfaces of the steel base, measured in grams per square metre of sheet or strip. In the case of differential coatings, the different surfaces are stated separately.

NOTE: The coating thickness is not subject to specification as it depends upon the coating alloy density, which varies with composition. The approximate coating thickness for various coating classes is given in Table C2 in Appendix C.

##### 1.3.2.1 One surface single spot coating mass

The minimum coating mass on any one surface of any one of the three specimens used for the triple spot test.

##### 1.3.2.2 Single sided coating mass—applicable for differential coatings, see Table 3.6

The mass of coating on any one surface of the steel base, measured in grams per square metre of sheet or strip, based on the average of three specimens selected from a sample representing the original cross section of the sheet or strip.

##### 1.3.2.3 Single spot coating mass

The coating mass for one of the three specimens used for the triple spot coating mass test.

##### 1.3.2.4 Triple spot coating mass

The average coating mass of three specimens selected from a sample representing the original cross-section of the sheet or strip.

#### 1.3.3 Coating type

The compositions of many of the metallic coatings described in this Standard are based around a nominal element, e.g. zinc, or a nominal combination of elements, e.g. 55% aluminium with balance zinc. In certain coatings there are additions of elements considered minor in their percentage, or influence in terms of the coating performance, e.g. the addition of 0.20% aluminium to control alloying in zinc type coatings.

The reference to 'minor additions of control elements' in this Standard is to cover these instances, i.e. minor additions of control elements are present at less than 1% by mass and do not fundamentally alter the overall properties of the coating type within which they are contained. Percentages referenced in the standard are mass %.

### 1.3.3.1 Zinc coating

A hot-dip coating of 99% zinc incorporating less than 1% of minor additions of control elements (Type Z) or a coating of zinc converted to a zinc/iron alloy (Type ZF).

### 1.3.3.2 Zinc/aluminium coating

A hot-dip coating of zinc with 3% to 15% aluminium and incorporating less than 1% of minor additions of control elements (Type ZA).

### 1.3.3.3 Zinc/aluminium/magnesium coating

A hot-dip coating of zinc with 5% to 13% aluminium, 2% to 4% magnesium and incorporating less than 1% of minor additions of control elements (Type ZM).

### 1.3.3.4 Aluminium/zinc alloy coating

A hot-dip coating of 50% to 60% aluminium, 1% to 2% silicon, with the remainder zinc, and incorporating less than 1% of minor additions of control elements. (Type AZ).

### 1.3.3.5 Aluminium/zinc/magnesium alloy coating

A hot-dip coating of 47% to 57% aluminium, 1% to 3% magnesium, 1% to 2% silicon with the remainder zinc, and incorporating less than 1% of minor additions of control elements (Type AM).

## 1.3.4 Differential coating

A coating whereby the manufacturer has deliberately applied a different coating mass to each side of the steel.

In the case of a differential coating the designation states the coating mass in  $\text{g/m}^2$  of sheet for each side separately, see Example 6 in Clause 1.5.3.

For a non-differential coating, the single sided coating mass in a single spot cannot be less than 40% of the stated total coating mass.

## 1.3.5 Sheet

A flat rolled product of any width and thickness coated by hot-dipping and supplied in cut lengths.

## 1.3.6 Strip

A flat rolled product of any width and thickness coated by hot-dipping and supplied in coil form.

## 1.4 SURFACE CONDITIONING AND SURFACE TREATMENT

### 1.4.1 General

Metallic coated steel products can be conditioned mechanically after coating, and can be supplied with a number of surface treatments. The required surface condition and treatment should be specified upon ordering with the supplier (see Appendix A).

### 1.4.2 Surface conditioning

#### 1.4.2.1 Skin passing

The metallic coated surface can be 'skin passed' after the coating process to produce a matte finish, typically for painting.

This process may disguise the natural spangled appearance of the product (see Clause 1.5.3.6.5 below) and is designated by the suffix 'S' after the coating mass, e.g. AZ150S.

NOTE: The purpose of the skin pass is to produce a higher degree of surface smoothness and thereby will change the surface appearance. Skin passing also temporarily minimizes the occurrence of a surface condition known as stretcher strain (Luders lines) or fluting during the fabrication of finished parts. The skin passing also controls and improves flatness. Some increase in hardness and loss of ductility will result from skin passing.

#### 1.4.2.2 *Spangle suppression*

Some manufacturers provide spangle suppression that can minimize or essentially disguise the natural spangled appearance of the product (see Clause 1.5.3.6.4). Suppression techniques can include water spraying to increase the coating cooling rate to make smaller spangles, chemical sprays that initiate many spangles and result in a smaller spangled appearance or the production of a spangle free coating by removing a spangle forming element.

### 1.4.3 **Chemical surface treatment**

#### 1.4.3.1 *Organic layer*

A thin organic layer can be applied to the coated steel surface to provide protection against finger printing during handling, and to provide lubrication to the surface to assist in subsequent forming operations. In some cases this organic layer can also contain a chemical to provide passivation protection (see Clause 1.4.3.2).

#### 1.4.3.2 *Passivation*

The application of a chemical solution to the coated steel surface in order to produce a thin, tightly adherent, reactive layer that provides a degree of protection against wet stack storage staining and minimizes early dulling of the surface.

#### 1.4.3.3 *Oiling*

The application of a light mineral oil to the surface of the coated steel in order to provide temporary protection prior to subsequent processing, e.g. painting. The oil is typically removed via chemical cleaning in the subsequent processing operation.

## 1.5 **PRODUCT DESIGNATION**

### 1.5.1 **General**

The product designation shall comprise, in sequence, the following elements:

- (a) The number of this Australian Standard, i.e. AS 1397.
- (b) The steel grade (see Clause 1.5.2).
- (c) The coating class and surface finish (see Clause 1.5.3).

*Example 1:*

AS 1397/G550 Z450

*Example 2:*

AS 1397/G2 Z275

*Example 3:*

AS 1397/G3N Z200S

## 1.5.2 Designation of steel grade

### 1.5.2.1 General

The designation of the steel grade, as given in Tables 2.1, 2.2 and 2.3 of Section 2, shall include a set of characters in accordance with the following:

- (a) First character—the letter ‘G’ to indicate that mechanical properties have been achieved or modified by in-line heat treatment prior to hot-dipping.
- (b) Second and subsequent characters—alphanumeric in accordance with Clauses 1.5.2.2 and 1.5.2.3.

### 1.5.2.2 For structural grades

The second, third and fourth characters shall represent the minimum yield strength, in megapascals, namely 250, 300, 350, 450, 500 and 550.

*Example 4:*

G550

### 1.5.2.3 For formability grades

The second character shall consist of the number 1, 2 or 3 to indicate formability, as follows:

- (a) Profiling: ..... 1
- (b) Commercial forming: ..... 2
- (c) Drawing: ..... 3

A third character, the letter N where applicable, shall be used to indicate non-ageing.

*Example 5:*

G3N

## 1.5.3 Designation of coating class and surface finish

### 1.5.3.1 Zinc coating class

The zinc coating class shall be designated by the prefix ‘Z’ or ‘ZF’ (see Clause 1.3.3.1), followed by a number representing the minimum coating mass, in grams per square metre of sheet or strip (total both surfaces), determined by the triple spot test (see Clause 3.2). For differential coatings, the designation shall include the minimum coating mass on each surface.

### 1.5.3.2 Zinc/aluminium coating class

The zinc/aluminium coating class shall be designated by the prefix ‘ZA’ (see Clause 1.3.3.2) followed by a number representing the minimum coating mass, in grams per square metre of sheet or strip (total both surfaces), determined by the triple spot test (see Clause 3.2).

### 1.5.3.3 Zinc/aluminium/magnesium coating class

The zinc/aluminium/magnesium alloy coating class shall be designated by the prefix ‘ZM’ (see Clause 1.3.3.3), followed by a number representing the minimum coating mass in grams per square metre of sheet or strip (total both surfaces), determined by the triple spot test (see Clause 3.2).

### 1.5.3.4 Aluminium/zinc coating class

The aluminium/zinc alloy coating class shall be designated by the prefix ‘AZ’ (see Clause 1.3.3.4), followed by a number representing the minimum coating mass, in grams per square metre of sheet or strip (total both surfaces), determined by the triple spot test (see Clause 3.2).

### 1.5.3.5 Aluminium/zinc/magnesium coating class

The aluminium/zinc/magnesium alloy coating class shall be designated by the prefix 'AM' (see Clause 1.3.3.5), followed by a number representing the minimum coating mass, in grams per square metre of sheet or strip (total both surfaces), determined by the triple spot test (see Clause 3.2).

*Example 6:*

Z450—a zinc coating with a total coating mass of 450 g/m<sup>2</sup> over both sides of the sheet, or Z120/60 (a different coating)—a differential zinc coating with a coating mass of 120 g/m<sup>2</sup> over one side of the sheet and 60 g/m<sup>2</sup> over the other side of the sheet.

*Example 7:*

ZF100—an annealed zinc coating of 100 g/m<sup>2</sup> over both sides of the sheet.

*Example 8:*

ZM180—a zinc/aluminium/magnesium coating with a total coating mass of 180 g/m<sup>2</sup> over both sides of the sheet.

*Example 9:*

AZ150—an aluminium/zinc coating with a total coating mass of 150 g/m<sup>2</sup> over both sides of the sheet.

*Example 10:*

AM125—an aluminium/zinc/magnesium coating with a total coating mass of 125 g/m<sup>2</sup> over both sides of the sheet.

### 1.5.3.6 Surface finish

#### 1.5.3.6.1 General

The natural appearance of continuous hot-dip metallic coated steel sheet and strip depends upon a number of factors including the coating composition, the steel surface roughness and the cooling rate to name three.

Designations for use when ordering are set out below.

#### 1.5.3.6.2 Regular spangle—designated 'R' or not stated

The finish achieved on hot-dip zinc type (Z) coatings which is seen as visible, multi-faceted zinc crystals referred to as spangles. The spangle size may be different from different coating facilities. In this case the coating cooling is typically not controlled to achieve a particular visual effect.

#### 1.5.3.6.3 Spangle free—'f'

The featureless, uniform surface finish produced on continuous hot-dip metallic coated steel sheet and strip where a distinct 'spangle' appearance, and the irregularities associated with the spangles, is not visible without magnification. Type ZA and ZM coatings are typically spangle free in their natural state.

#### 1.5.3.6.4 Minimized spangle—designated 'M'

The manufacturer has deliberately changed the solidification and/or cooling of the coating to produce a finish where the zinc crystals are still visible to the eye without magnification, but are typically smaller and less distinct than the pattern visible on regular spangled product.

#### 1.5.3.6.5 *Skin passed or smooth finish—designated 'S'*

Skin passing of the coated product can produce a smooth, matte finish often desirable for painting (refer to Clause 1.4.2.1, and Appendix D, Paragraph D2.1).

*Example 11:*

ZM180S for a Type ZM coating at a nominal coating mass of 180 g/m<sup>2</sup> that has been skin passed; or

Z275MS for a Type Z coating at a nominal coating mass of 275 g/m<sup>2</sup> that has been manufactured with minimized spangle and has been skin passed.

### 1.6 ROUNDING OF TEST RESULT VALUES

#### 1.6.1 General

With the exception of the tensile test and coating mass results, the observed or calculated values shall be rounded to the same number of figures as in the specified values and then compared with the specified values (see also AS 2706).

#### 1.6.2 For tensile test results

The determined value of tensile strength shall be rounded to the nearest 10 MPa and the determined value of yield strength shall be rounded to the nearest 5 MPa.

#### 1.6.3 For coating mass results

The determined value of coating mass shall be rounded to the nearest 5 g/m<sup>2</sup>.

### 1.7 MARKING

#### 1.7.1 Package

Each package for delivery shall be legibly and durably marked or tagged to enable it to be identified with this Standard. The information on the package shall also include the following:

- (a) The product designation (as per Clause 1.5).
- (b) The product dimensions.
- (c) The manufacturer's name or trademark.
- (d) For differential coated sheet or strip, identification of the side which has the heavier coating.
- (e) A unique identifier to facilitate product traceability.

#### 1.7.2 Product

The sheet or strip shall be legibly and durably marked with the number of this Australian Standard, i.e. AS 1397, the base steel thickness, and the designation of the steel base and coating, unless such markings are clearly detrimental to the end use, in which case the package shall be so marked.

## SECTION 2 THE STEEL BASE

### 2.1 SCOPE OF SECTION

This section specifies requirements for nine grades of steel sheet and strip: three grades are based on formability and six structural grades are based on yield stress.

### 2.2 CHEMICAL COMPOSITION

#### 2.2.1 General

The method of sampling for chemical analysis shall be in accordance with AS/NZS 1050.1 Chemical composition shall be determined by any procedures which are at least as accurate as those given in the AS/NZS 1050 series of Standards.

#### 2.2.2 Cast analysis

Wherever possible, a chemical analysis of the steel from each ladle shall be made to determine the proportions of the specified elements. In cases where it is impracticable to obtain samples from the liquid steel, analysis on test samples taken in accordance with the requirements of AS/NZS 1050.1 may be reported as the cast analysis.

The reported cast analysis of the steel shall conform to the limits given in Table 2.1 for the appropriate grade.

#### 2.2.3 Unspecified chemical elements

For steels complying with this Standard, elements not specified in Table 2.1 shall not be present in quantities detrimental to the intended use of the steel.

#### 2.2.4 Product analysis

Any subsequent analytical checks carried out on the product shall take into consideration the heterogeneity characteristic of the type of steel.

**TABLE 2.1**  
**REQUIREMENTS FOR CHEMICAL COMPOSITION**

| Steel grade designation<br>AS 1397 | Chemical composition (cast analysis), % max. |           |            |        |
|------------------------------------|--|-----------|------------|--------|
|                                    | Carbon                                       | Manganese | Phosphorus | Sulfur |
| G450, G500, G550                   | 0.20   | 1.20      | 0.040      | 0.030  |
| G300, G350 (see Note)              | 0.30   | 1.60      | 0.100      | 0.035  |
| G250, G1                           | 0.12   | 0.50      | 0.040      | 0.035  |
| G2                                 | 0.10   | 0.45      | 0.030      | 0.030  |
| G3                                 | 0.08   | 0.40      | 0.020      | 0.025  |

NOTE: For grade G300, nitrogenized steel may be used for sections greater than 1.00 mm thick.

### 2.3 TENSILE TEST

#### 2.3.1 General

When tested in accordance with AS 1391, the tensile properties shall meet the requirements of Tables 2.2 and 2.3.

### 2.3.2 Orientation of test piece

#### 2.3.2.1 For formability grades

For Grades G1, G2 and G3, the tensile test piece shall be cut transverse to the direction of rolling.

#### 2.3.2.2 For structural grades

For Grades G250, G300, G350, G450, G500 and G550, the tensile test piece shall be cut parallel to the direction of rolling.

#### NOTES:

- 1 It is international practice to tensile test zinc-coated sheet and strip with the coating intact, and to calculate the strength using the cross-sectional area of the steel base metal only, since the contribution made by the zinc coating is so small that, for practical purposes, it can be ignored. The strength value obtained is close to the strength of the base material itself.

A similar testing practice with aluminium/zinc-coated products will give higher yield and tensile strength values than those of the base material itself, because the coating makes an appreciable contribution to these values (see Note 2). Nevertheless, this practice will continue because the coating also reduces the ductility of the material, i.e. the specimens will be tested with the coating intact.

- 2 Design calculations, therefore, should be made on base steel thickness; the effect of the coating will then be accounted for in the quoted strength values which will represent the typical behaviour of the product in practice.

## 2.4 BEND TEST

### 2.4.1 General

The test piece with the coating intact shall be bend tested at room temperature in accordance with AS 2505.1. For structural grades, the test piece shall be bent around a mandrel with an external diameter specified in Table 2.2 and for formability grades, the test piece shall be bent flat to the requirements of Table 2.3. After the test, the coating shall be stripped from the bend, using a process that does not induce cracking, and the surface examined. No cracks shall be visible on the outside of the bend. Small cracks at the edges and cracks which require magnification to be visible shall be disregarded.

### 2.4.2 Orientation of test pieces

The test pieces for both formability and structural grades shall be cut transverse to the direction of rolling and bent with the bend axis parallel to the direction of rolling.

## 2.5 DIMENSIONAL TOLERANCES

### 2.5.1 General

The dimensional tolerances of the base steel, including width, thickness, flatness and camber, shall be in accordance with the requirements of AS/NZS 1365:1996 Section 5: Cold-rolled sheet and strip.

### 2.5.2 Specified thickness

The thickness of the steel base of the sheet or strip shall be specified, as this thickness is required for design purposes. It shall be measured not closer than 50 mm from the sheared edge.

**TABLE 2.2**  
**MECHANICAL PROPERTY REQUIREMENTS FOR STRUCTURAL GRADES**

| Steel grade designation | Longitudinal tensile test           |                              |                             |               | Transverse bend test     |   |
|-------------------------|-------------------------------------|------------------------------|-----------------------------|---------------|--------------------------|---|
|                         | Min. yield strength (Note 1)<br>MPa | Min. tensile strength<br>MPa | Min. elongation, % (Note 2) |               | Angle of bend<br>degrees | Diameter of mandrel in terms of test piece thickness ( <i>t</i> ) |
|                         |                                     |                              | $L_0 = 50$ mm               | $L_0 = 80$ mm |                          |   |
| G250                    | 250                                 | 320                          | 25                          | 22            | 180                      | 0   |
| G300                    | 300                                 | 340                          | 20                          | 18            | 180                      | <i>t</i>  |
| G350                    | 350                                 | 420                          | 15                          | 14            | 180                      | 2 <i>t</i>  |
| G450 (Note 3)           | 450                                 | 480                          | 10                          | 9             | 90                       | 4 <i>t</i>  |
| G500 (Note 4)           | 500                                 | 520                          | 8                           | 7             | 90                       | 6 <i>t</i>  |
| G550 (Note 5)           | 550                                 | 550                          | 2                           | 2             | —                        | —   |

## NOTES:

- 1 The yield strength is the lower yield stress. If well-defined yielding is not obvious, the 0.2% proof stress should be determined.
- 2 Applies to test pieces equal to or greater than 0.6 mm in thickness. For material up to 0.6 mm in thickness, the minimum elongation values in the table are not covered by this Standard.  
 $L_0$  = original gauge length.
- 3 Applies to recovery annealed, i.e. not recrystallized after annealing, material equal to or greater than 1.50 mm thick.
- 4 Applies to recovery annealed, i.e. not recrystallized after annealing, material between 1.00 mm and 1.50 mm thick.
- 5 Applies to recovery annealed, i.e. not recrystallized after annealing, material up to and including 1.00 mm thick; the values of yield strength, 0.2% proof stress and tensile strength are, for practical purposes, the same.

**TABLE 2.3**  
**MECHANICAL PROPERTY REQUIREMENTS**  
**FOR FORMABILITY GRADES**

| Steel grade designation | Transverse tensile test (see Note 1) |          | Transverse bend test | Thickness range for lockseam (see Note 2)<br>mm |
|-------------------------|--------------------------------------|----------|----------------------|---|
|                         | Min. elongation, %                   |          | Degree of bend       |   |
|                         | on 50 mm                             | on 80 mm |                      |   |
| G1                      | —                                    | —        | 180°                 | —   |
| G2 (Note 3)             | 30                                   | 27       | 180°                 | ≤ 1.60  |
| G3 (Note 3)             | 35                                   | 32       | 180°                 | All   |

## NOTES:

- 1 Applies to test pieces equal to or greater than 0.60 mm thick. Refer to supplier for typical yield and tensile strengths for design purposes.
- 2 The ability of grades to lockseam is dependent on recognized profiling practices and machine settings to avoid excessive stretching of the product.
- 3 For information on fabricating characteristics see Paragraph D2 of Appendix D.

## SECTION 3 THE COATING

**3.1 SCOPE OF SECTION**

This Section specifies requirements for the following coating classes:

- (a) Zinc coating (Z).
- (b) Zinc coating converted to zinc/iron alloy (ZF).
- (c) Zinc/aluminium (ZA).
- (d) Zinc/aluminium/magnesium (ZM).
- (e) Aluminium/zinc (AZ)
- (f) Aluminium/zinc/magnesium (AM) coatings.

**3.2 DETERMINATION OF COATING MASS****3.2.1 General**

When test specimens meeting the requirements of Clause 3.2.2 are tested in accordance with one of the methods specified in AS 2331, Methods 2.1 or 2.3, or in accordance with Clause 3.2.3, or when continuous monitoring is used in accordance with Clause 3.2.4, the coating mass shall conform to the requirements of Table 3.1 to Table 3.5 for the appropriate coating class or Table 3.6 for the appropriate differential sided coating class.

**3.2.2 Test specimens for spot tests**

Spot tests shall be performed on test specimens, each having an approximate area of 2000 mm<sup>2</sup> to 5000 mm<sup>2</sup>, selected as follows:

- (a) *For triple spot tests* The triple spot test is performed on three specimens selected from a sample (commonly 300 mm × full width), representing the original cross-section of the strip. One specimen is cut from the mid-width position and the others from a position near each edge of the strip but not closer than 25 mm to the edge.
- (b) *For single spot tests* The single spot test is performed on one of the three specimens selected for the triple spot test.
- (c) *For one surface single spot test* The one surface single spot test is performed on one of the three specimens selected for the triple spot test.

**3.2.3 Offline testing**

X-ray fluorescence methods in accordance with ASTM A754 may be used as laboratory offline instruments in place of AS 2331, Methods 2.1 or 2.3.

**3.2.4 Continuous monitoring**

Strip traversing using the double-sided fluorescence method in accordance with ASTM A754 may be employed.

### 3.3 DETERMINATION OF COATING ADHESION

#### 3.3.1 General

When tested in accordance with AS 2505.1, both surfaces of test specimens shall be capable of being bent 180° around a mandrel with a diameter specified in Table 3.7, without flaking of the coating. Failure of the coating within 5 mm of the edge of the test specimen shall be disregarded.

NOTES:

- 1 Although the direction of testing is not significant, a longitudinal test piece (the axis of bend at right angles to the rolling direction) should be selected to reduce the incidence of base failure on the less formable grades before the specified adhesion limit has been reached.
- 2 Because of the brittle nature of the zinc/iron alloy, some powdering of the coating may occur on Class ZF coatings, particularly on the compression bends.
- 3 For differential coatings, testing for coating adhesion on each side is subject to agreement between purchaser and supplier.

#### 3.3.2 Selection of test specimen

The test specimen may be selected from any part of the sample. The minimum test specimen width shall be 50 mm.

**TABLE 3.1**  
**COATING MASS REQUIREMENTS:**  
**TYPES 'Z' and 'ZF' COATINGS**

| Coating class designation | Minimum coating mass, g/m <sup>2</sup> |             |             |
|---------------------------|--|-------------|-------------|
|                           | Total both surfaces                    |             | One surface |
|                           | Triple spot                            | Single spot | Single spot |
| Z100                      | 100                                    | 90          | 40          |
| Z200                      | 200                                    | 180         | 80          |
| Z275                      | 275                                    | 250         | 110         |
| Z350                      | 350                                    | 315         | 140         |
| Z450                      | 450                                    | 405         | 180         |
| Z600                      | 600                                    | 540         | 240         |
| ZF80                      | 80                                     | 70          | 30          |
| ZF100                     | 100                                    | 90          | 40          |

**TABLE 3.2**  
**COATING MASS REQUIREMENTS:**  
**TYPE 'ZA' COATINGS**

| Coating class designation | Minimum coating mass, g/m <sup>2</sup> |             |             |
|---------------------------|--|-------------|-------------|
|                           | Total both surfaces                    |             | One surface |
|                           | Triple spot                            | Single spot | Single spot |
| ZA90                      | 90                                     | 80          | 35          |
| ZA135                     | 135                                    | 120         | 55          |
| ZA180                     | 180                                    | 160         | 70          |
| ZA225                     | 225                                    | 200         | 90          |
| ZA275                     | 275                                    | 250         | 110         |
| ZA350                     | 350                                    | 315         | 140         |
| ZA450                     | 450                                    | 405         | 180         |

**TABLE 3.3**  
**COATING MASS REQUIREMENTS:**  
**TYPE 'ZM' COATINGS**

| Coating class designation | Minimum coating mass, g/m <sup>2</sup> |             |             |
|---------------------------|--|-------------|-------------|
|                           | Total both surfaces                    |             | One surface |
|                           | Triple spot                            | Single spot | Single spot |
| ZM60                      | 60                                     | 54          | 24          |
| ZM90                      | 90                                     | 80          | 35          |
| ZM120                     | 120                                    | 110         | 50          |
| ZM150                     | 150                                    | 135         | 60          |
| ZM180                     | 180                                    | 160         | 70          |
| ZM220                     | 220                                    | 200         | 90          |
| ZM275                     | 275                                    | 250         | 110         |
| ZM350                     | 350                                    | 315         | 140         |
| ZM450                     | 450                                    | 405         | 180         |

**TABLE 3.4**  
**COATING MASS REQUIREMENTS:**  
**TYPE 'AZ' COATINGS**

| Coating class designation | Minimum coating mass, g/m <sup>2</sup> |             |             |
|---------------------------|--|-------------|-------------|
|                           | Total both surfaces                    |             | One surface |
|                           | Triple spot                            | Single spot | Single spot |
| AZ150                     | 150                                    | 135         | 60          |
| AZ200                     | 200                                    | 180         | 80          |

**TABLE 3.5**  
**COATING MASS REQUIREMENTS:**  
**TYPE 'AM' COATINGS**

| Coating class designation | Minimum coating mass, g/m <sup>2</sup> |             |             |
|---------------------------|--|-------------|-------------|
|                           | Total both surfaces                    |             | One surface |
|                           | Triple spot                            | Single spot | Single spot |
| AM100                     | 100                                    | 90          | 40          |
| AM125                     | 125                                    | 115         | 50          |
| AM150                     | 150                                    | 135         | 60          |
| AM175                     | 175                                    | 160         | 70          |
| AM200                     | 200                                    | 180         | 80          |

**TABLE 3.6**  
**COATING MASS REQUIREMENTS:**  
**DIFFERENTIAL COATINGS**

| Coating class designation | Minimum coating mass, g/m <sup>2</sup> |             |
|---------------------------|--|-------------|
|                           | One surface                            |             |
|                           | Triple spot                            | Single spot |
| Z60/30                    | 60/30                                  | 50/25       |
| Z120/60                   | 120/60                                 | 95/50       |
| Z x/y                     | x/y                                    | 0.8x/0.8y   |

NOTE: The letters x and y represent single-side coating mass values.

TABLE 3.7  
COATING ADHESION (180° BEND TEST) REQUIREMENTS

| Steel grade designation | Diameter of mandrel in terms of thickness of product ( $t$ ) |   |  |                          |                          |      |                                    |                           |
|-------------------------|--|---|--|--------------------------|--------------------------|------|------------------------------------|---------------------------|
|                         | Coating class  |   |  |                          |                          |      |                                    |                           |
|                         | 'Z', 'ZA' and 'ZM'   |   |  |                          |                          |      | 'AZ' and 'AM'                      |                           |
|                         | Z100,<br>ZA90  | Z200,<br>ZA135,<br>ZA180,<br>ZM90,<br>ZM120,<br>ZM150,<br>ZM180 | Z275,<br>ZA225,<br>ZA275,<br>ZM220,<br>ZM275 | Z350,<br>ZA350,<br>ZM350 | Z450,<br>ZA450,<br>ZM450 | Z600 | AZ150,<br>AM100,<br>AM125<br>AM150 | AZ200,<br>AM175,<br>AM200 |
| G250                    | 0  | 0   | 0  | 0                        | $t$                      | $2t$ | 0                                  | $t$                       |
| G300                    | 0  | 0   | $t$  | $t$                      | $t$                      | $2t$ | $t$                                | $t$                       |
| G350                    | 0  | 0   | $t$  | $t$                      | $t$                      | $2t$ | $t$                                | $t$                       |
| G450                    | 0  | $t$   | $2t$   | $2t$                     | $2t$                     | $3t$ | $2t$                               | $2t$                      |
| G500                    | $t$  | $2t$  | $2t$   | $2t$                     | $2t$                     | $3t$ | $2t$                               | $2t$                      |
| G550                    | $t$  | $2t$  | $2t$   | $2t$                     | $2t$                     | $3t$ | $2t$                               | $2t$                      |
| G1                      | 0  | 0   | 0  | 0                        | $t$                      | $2t$ | 0                                  | 0                         |
| G2                      | 0  | 0   | 0  | 0                        | $t$                      | $2t$ | 0                                  | 0                         |
| G3                      | 0  | 0   | 0  | 0                        | $t$                      | $2t$ | 0                                  | 0                         |

## NOTES:

- 0 indicates that the coated steel is bent flat on itself.
- For AM and AZ type coatings produced on continuous, metallic coating lines, the combination of coating pot temperature and after pot cooling results in a higher amount of carbon going into the solid-state solution which is then retained in the rapid cooling. For this reason the grades G1, G2 and G3 are not generally supplied for these coating types. A grade G2N produced from vacuum degassed and stabilized steel is available.

APPENDIX A  
PURCHASING GUIDELINES  
(Informative)

## A1 GENERAL

Australian Standards are intended to include the technical requirements for relevant products but do not purport to comprise all the necessary provisions of a contract. This Appendix contains advice and recommendations on the information to be supplied by the purchaser at the time of enquiry or order.

## A2 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The purchaser should supply the following information at the time of enquiry and order:

- (a) The number of this Australian Standard, i.e. AS 1397.
- (b) Type of product required (coils (strip) or cut lengths (sheet)).
- (c) Designation of steel grade (see Clause 1.5, Table 2.1 and Appendix D).
- (d) Designation of coating class (see Clause 1.5 and Tables 3.1 to 3.6).
- (e) Surface finish, including any chemical treatment required (see Clause 1.5).
- (f) Quantity (mass, or number of sheets) and delivery instructions (dates, schedules, delivery points).
- (g) Dimensions, including thickness, width and length, and reference to AS/NZS 1365 for appropriate tolerances.
- (h) Defects allowable.

### NOTES:

- 1 Defects such as laminations, segregation or surface flaws cannot be completely quantified. Where the presence, size or frequency of any defects is considered to be of concern, arrangements should be made between the purchaser and the manufacturer. These arrangements may be achieved by the provision of acceptance type samples. Where defects are present and the product is submitted for acceptance, the manufacturer should be able to demonstrate fitness for purpose.
  - 2 It is to be expected that the degree or amount of allowable defects in coils (strip) would be more than in cut lengths (sheet) because of the impracticability of inspection and the impossibility of rejecting portions of a coil without generating small coils.
- (i) The testing requirements, the frequency of testing (see Appendix B), and whether a test certificate is required.

### NOTES:

- 1 The certificate issued by the supplier of the steel may be submitted as evidence of compliance in respect of cast analysis.
- 2 If the purchaser is likely to require referee testing, or testing by an independent authority to verify compliance with this Standard, requirements should be negotiated prior to order.

- (j) Whether it is the intention of the purchaser to inspect the coated steel at the manufacturer's works.

NOTE: Inspection at the manufacturer's works is usually not requested, since the purchaser may reject the coated steel sheet or strip if faults are revealed in subsequent processing.

If it is the purchaser's intention to undertake any of the following functions at the manufacturer's works, this should be notified at the time of enquiry and order, and should be accomplished in a manner which will not interfere with the operation of the works:

- (a) Inspection of the coated steel.
- (b) Selecting and identifying the test samples.
- (c) Witnessing tests.

The manufacturer should afford the purchaser all reasonable facilities to ensure that the coated steel is in accordance with the requirements of this Standard.

- (k) Any special or supplementary requirements.

NOTE: When strip is required, checks should be made to ensure that the purchaser's equipment can handle the coils ordered. If any limitations exist in respect of coil mass, or the inside or outside diameters of coils, this should be stated at the time of enquiry and order.

When cut lengths are required, any limitations in respect of packaging, e.g. number or mass of sheets per pack or packaging materials, should be stated at the time of enquiry and order.

- (l) Any information concerning processing or end use that the purchaser considers would assist the manufacturer. Note that soldering of material having an aluminium/zinc coating is not practicable.

## APPENDIX B PRODUCT CONFORMITY

(Normative)

### B1 SCOPE

This Appendix sets out the minimum sampling and testing plan for product conformity to this Standard which shall be demonstrated by the manufacturer or supplier. The product conformity requirements shall enable conformity assessment to be made by a manufacturer or supplier (first party), a user or purchaser (second party), or an independent body (third party), and shall not be dependent on a quality management systems standard (e.g. AS/NZS ISO 9001).

NOTES: These provisions are based on:

- 1 ISO/IEC Directives, Part 2, *Rules for the structure and drafting of International Standards*, 5th Edition, 2004.
- 2 ISO/IEC Directives, *Supplement—Procedures specific to IEC*, 4th Edition, 2009.
- 3 IEC, Conformity Assessment Board (CAB/822/INF, 2009-05-27), Agenda item 7.2, ISO/IEC Directives, text concerning conformity assessment: current status.

### B2 SAMPLING AND TESTING

#### B2.1 General

Sampling and testing shall be carried out by the manufacturer in accordance with Paragraph B2.2 or B2.3 as appropriate. For every batch, the steel and coating properties set out in this Standard shall be obtained in accordance with Paragraph B2.2 as appropriate.

The manufacturer or supplier shall ensure that product which does not meet the requirements of the Standard is identified, deemed nonconforming and controlled to prevent unintended use or delivery. The results from the nonconforming tests shall be excluded from the long-term conformance calculations.

Should a failure on retesting occur, then the quarantined batch shall be rejected or satisfy the provisions of Paragraph B2.3.2.

#### B2.2 Minimum batch sampling and testing

The term 'batch' has been defined in Clause 1.3.1.

For the steel base requirements of the Standard as defined in Section 2, batches shall be sampled each 50 t as a minimum, or at each process change whereby a different grade, or dimension will be produced in a continuous process, and tested in accordance with the requirements of Section 2.

For the coating requirements of the Standard as defined in Section 3, batches shall be sampled each 50 t as a minimum, or at each process change whereby a different coating type or coating class will be produced in a continuous process and tested in accordance with the requirements of Section 3.

## **B2.3 Statistical sampling**

### **B2.3.1 General**

Process verification by statistical sampling or alternate methods can be used to demonstrate product conformity where conditions required by this Clause are met. Where it can be demonstrated that the base steel and coating properties, as defined in this Standard, of any group of products manufactured under the same conditions of steel supplier, steel grade and steel processing (e.g. mill) are distributed normally, then it shall be permissible to adopt statistical sampling to verify process acceptance for each product in accordance with ISO 7966.

For product conformance to this Standard via statistical sampling, the inputs of process acceptance verification, ongoing testing and statistical sampling shall be demonstrated and, where applicable, also maintained. Additionally, any sample or sampling that indicates a predicted proportion of nonconforming product in excess of an amount considered within the demonstrated statistical sampling method shall cause sampling for that combination of size, thickness and grade to revert to batch testing rules until it can be demonstrated that the conditions of statistical sampling are valid for that combination. In the event of actual nonconforming test results, the retest provisions of normal batch testing shall also apply.

NOTE: Statistical sampling is a procedure, which enables decisions to be made about the quality of batches of items after inspecting or testing only a portion of those items. This procedure will only be valid if the sampling plan has been determined on a statistical basis and the following requirements are met:

- (a) The sample is drawn randomly from a population of product of known history. The history shall enable verification that the product was made from known materials at essentially the same time, by essentially the same processes and under essentially the same system of control.
- (b) For each different situation, a suitable sampling plan needs to be defined. A sampling plan for one manufacturer of given capability and product throughput may not be relevant to another manufacturer producing the same items.

In order for statistical sampling to be meaningful to the customer, the manufacturer or supplier needs to demonstrate how the above conditions have been satisfied. Sampling and the establishment of a sampling plan should be carried out in accordance with recognized standards, e.g. AS 2490 and AS 1199.

Under this approach ongoing sampling and testing of product shall be directed primarily at monitoring the process to ensure that product outcomes are acceptable and within characteristic ranges, as well as stable and under control.

### **B2.3.2 Retest**

If a test fails to meet the specified results, two or more pieces shall be taken at random from the same lot and retested. Both retests shall conform to the requirements of this Standard (AS 1397), otherwise the lot shall be rejected.

## APPENDIX C

## INFORMATION ON COATING THICKNESS DETERMINATION AND ON THE THICKNESS/MASS RELATIONSHIP BETWEEN BASE STEEL AND COATING

(Informative)

**C1 GENERAL**

This Appendix gives information on the following:

- (a) The calculation of total coating thickness.
- (b) The thickness of the base steel and the calculated equivalent mass of steel plus coating, per unit area.
- (c) The approximate coating thickness which results from the coating mass for the various coating types.

**C2 CALCULATION OF TOTAL COATING THICKNESS**

With reference to Figure C1 which gives an example of a square sample of coated steel (coating class designation AZ150) of surface area 1 m<sup>2</sup>, the total coating thickness is calculated as follows:

|                                       |   |  |
|---------------------------------------|---|--|
| Actual coating mass of sample         | = | mass on surface A + mass on surface B  |
|                                       | = | 170 g/m <sup>2</sup>   |
| Approximate total thickness of sample | = | nominal base metal thickness (0.42 mm)<br>plus coating thickness on both surfaces<br>(0.025 mm + 0.025 mm) |
|                                       | = | 0.42 + 0.05  |
|                                       | = | 0.47 mm  |

NOTE: The base metal thickness is required for the calculation of structural properties and the coating mass is required to indicate the level of corrosion resistance of the material. The total coated thickness is required to confirm that the metal is compatible with machine clearances, and as an approximate field measurement, to ascertain compliance with the ordered thickness. In the case of differential coatings, the symbols A and B will have different values.

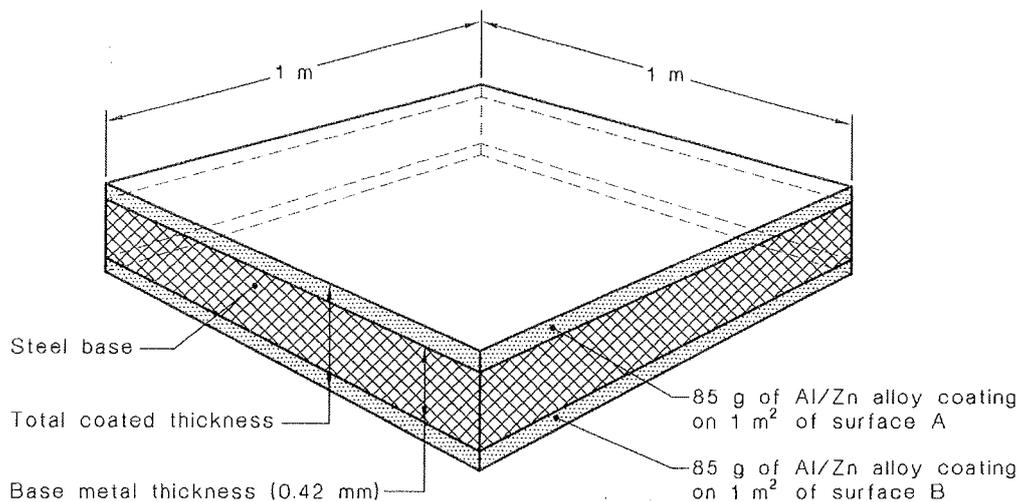


FIGURE C1 COATING MASS ILLUSTRATION (NOMINAL 150 g/m<sup>2</sup> OF SHEET)

### C3 THE MASS PER SQUARE METRE OF STEEL PLUS COATING

The mass per square metre of steel can be calculated using the following procedure:

- (a) Calculate the mass,  $m$ , of 1 square metre of uncoated steel sheet for varying steel base thicknesses from the following equation:

$$m = \frac{\rho \times d}{1000}$$

where

$\rho$  = density of steel, taken as 7850 kg/m<sup>3</sup>

$d$  = thickness of steel, in millimetres

*Examples:*

C1 For 0.30 mm base thickness,  $m = \frac{7850 \times 0.30}{1000} = 2.355 \text{ kg.}$

C2 For 1.20 mm base thickness,  $m = \frac{7850 \times 1.20}{1000} = 9.420 \text{ kg.}$

- (b) Add the appropriate coating mass (from Table C2) to the calculated mass ( $m$ ) of uncoated steel sheet.

*Examples:*

C3 For 0.30 mm base thickness with a coating type designation Z275, the mass of 1 m<sup>2</sup> of coated sheet = 2.355 + 0.290 = 2.645 kg.

C4 For 1.20 mm base thickness with a coating type designation AZ150, the mass of 1 m<sup>2</sup> of coated sheet = 9.420 + 0.170 = 9.590 kg.

C5 For differential coatings, the actual mass of the coating with manufacturing tolerances can be assumed to be 1.1 ( $x + y$ ) (see Table 3.6).

### C4 APPROXIMATE COATING THICKNESS

Coating thickness is not subject to specification. To assist the designer, the approximate coating thickness (total both sides) for various coating types is given for information in Table C2.

**TABLE C2**  
**COATING MASS (TOTAL BOTH SIDES, see Note 1), APPROXIMATE COATING THICKNESS (TOTAL BOTH SIDES, see Note 2) and MINIMUM COATING THICKNESS (ONE SIDE, see Note 3)**

| Coating type designation | Coating mass sum of both sides*<br>g/m <sup>2</sup> | Approximate coating thickness sum of both sides<br>mm † | Minimum coating thickness, µm, on one surface ‡ |
|--------------------------|---|---|---|
| Z100                     | 130   | 0.02  | 6   |
| Z200                     | 220   | 0.03  | 11  |
| Z275                     | 290   | 0.04  | 15  |
| Z350                     | 370   | 0.05  | 20  |
| Z450                     | 470   | 0.07  | 25  |
| Z600                     | 650 ≤ 2.0 mm thick<br>680 >2.0 mm thick             | 0.09<br>0.10  | 34  |
| ZF80                     | 100   | 0.01  | 4   |
| ZF100                    | 130   | 0.02  | 6   |
| ZA90                     | 100   | 0.015   | 5   |
| ZA135                    | 145   | 0.025   | 8   |
| ZA180                    | 190   | 0.032   | 11  |
| ZA225                    | 235   | 0.04  | 14  |
| ZA275                    | 290   | 0.05  | 17  |
| ZA350                    | 370   | 0.06  | 21  |
| ZA450                    | 470   | 0.08  | 27  |
| ZM60                     | 65  | 0.01  | 4   |
| ZM90                     | 100   | 0.015   | 6   |
| ZM120                    | 135   | 0.02  | 8   |
| ZM150                    | 170   | 0.03  | 10  |
| ZM180                    | 195   | 0.035   | 12  |
| ZM220                    | 235   | 0.04  | 15  |
| ZM275                    | 290   | 0.05  | 18  |
| ZM350                    | 370   | 0.07  | 23  |
| ZM450                    | 470   | 0.08  | 30  |
| AZ150                    | 170   | 0.05  | 16  |
| AZ200                    | 220   | 0.06  | 22  |
| AM100                    | 110   | 0.03  | 11  |
| AM125                    | 135   | 0.04  | 14  |
| AM150                    | 170   | 0.045   | 17  |
| AM175                    | 190   | 0.05  | 19  |
| AM200                    | 215   | 0.06  | 22  |

\* The coating mass used for thickness calculations includes an approximate manufacturing margin that may be used to achieve the specified minimum requirements.

† Total coating thickness of both sides based upon nominal coating class.

‡ Thickness equivalent to the one surface single spot coating mass.

## NOTES TO TABLE C2

- 1 It is common for manufacturers to apply more than the nominal coating mass to ensure that one surface single spot and single spot requirements are met. The numbers in the 'coating mass both sides' column give an indication of these coating masses.
- 2 The numbers in the 'approximate coating thickness, both sides' column are calculated thicknesses corresponding to the expected coating masses. Users can add these thicknesses to the base steel thickness to determine a total coated thickness.
- 3 The 'minimum coating thickness,  $\mu\text{m}$ , on one surface' is a calculated thickness based upon the one surface single spot coating mass and the respective coating density for each coating type. Where a type spans a range of composition, the densest figure is used to give the lowest thickness for each class.
- 4 The calculations for the coating types in Table C2 are based upon coating densities as follows:
  - Types 'Z' and 'ZF':  $7140 \text{ kg/m}^3$
  - Type 'ZA': For 4% to 9% aluminium use  $6000 \text{ kg/m}^3$ ; for 9% to 15% aluminium use  $5600 \text{ kg/m}^3$
  - Type 'ZM': For 5% to 9% aluminium use  $6000 \text{ kg/m}^3$ ; for 9% to 13% aluminium use  $5590 \text{ kg/m}^3$
  - Type 'AZ':  $3680 \text{ kg/m}^3$
  - Type 'AM':  $3622 \text{ kg/m}^3$

These densities can also be used for calculating the thickness on each surface of differential coatings.

## APPENDIX D

### INFORMATION AND GUIDELINES ON THE SELECTION OF STEEL GRADES AND COATING CLASSES

(Informative)

#### D1 SCOPE AND CHANGES TO THIS STANDARD

##### D1.1 Scope

This Appendix gives information on fabricating characteristics and surface finish, and provides guidelines on the application of coated steels complying with this Standard.

The information refers to the generic coating types, for example aluminium-zinc coatings, and not to commercially available coated steel products. Information about commercially available products can be obtained from manufacturers or suppliers. The information that is included in Appendix D is generic, and where possible obtained from publicly available sources such as Edavan and Kopinski's (2009) paper from the Corrosion Science Journal\*.

##### D1.2 Changes made to this Standard in this revision, and explanatory notes

Revision of this Standard includes:

- (a) The addition of three new coating types, as follows:
  - (i) Zinc-aluminium coatings in 7 classes, 'ZA'.
  - (ii) Zinc-aluminium-magnesium coatings in 9 classes, 'ZM'.
  - (iii) Aluminium-zinc-magnesium coatings in 4 classes, 'AM'.
- (b) The inclusion of an indicative minimum coating thickness for each of the coating types and classes corresponding to the one surface single spot coating masses in Table C2.

Descriptions of typical applications for the coating types are included in section D3 below. For each of the coating types there are a number of coating classes referenced that cover the range of usage for each of the coating types in the Australian market.

Different coating types protect steel with differing mechanisms so it is not possible to conclude that a thicker coating of one type will necessarily outperform a thinner coating of another type. It is the case though, that within each coating type, e.g., Type Z, in a specific environment a higher coating class, e.g. Z275, can be expected to provide a longer life than a lower coating class, e.g. Z200, on an undeformed section.

Zinc coatings in the Australian construction industry are typically encountered in two broad categories, i.e. continuously coated sheet and coil steels as covered in AS 1397, and batch galvanized coatings as covered in AS/NZS 4680. There are important differences between the ways that these Standards specify the amount of coating on the steel in each case.

In AS 1397, the coating is specified as a total coating mass that is the average coating across the sheet or coil width, inclusive of both top and bottom surfaces, per m<sup>2</sup>. Minimum masses are also given for a single spot and a single surface of a spot. Indicative thicknesses for the minimum spot surface are also given, but not specified.

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\* Edavan, R.P., & Kopinski, R. (2009). *Corrosion resistance of painted zinc alloy coated steels*. Corrosion Science, 51, 2429-2442.

AS/NZS 4680 covers hot-dip zinc coatings on fabricated ferrous articles, and unlike the steel sheet and coil covered in AS 1397, the top and bottom surfaces are not generally interchangeable, and so an average coating mass inclusive of both top and bottom surfaces is not necessarily meaningful. Also, fabricated articles often include different thicknesses of steel in the one article. On this basis, AS/NZS 4680 specifies the coating in terms of local coating thickness minima, and also average coating mass minima in  $\text{g/m}^2$ , both in terms of one surface only.

Each of the coating types in AS 1397, other than the zinc 'Z' and annealed zinc 'ZF' coatings, contain significant amounts of aluminium. Batch galvanizing processes based upon the use of chemical fluxes have not traditionally been capable of applying coatings containing aluminium, and hence the batch galvanizing of fabricated articles has been limited to zinc coatings.

Coating types ZA, ZM, AZ and AM are alloy coatings designed to offer more efficient protection in specific environments and applications than plain zinc, and hence their protection of steel cannot be compared to zinc through simple comparisons of thickness. For example, an AZ150 coating on 0.42 mm steel roofing has approximately the same coating thickness as a Z275 coating on the same steel, yet the AZ150 coated steels have been seen to offer longer life across a wide range of corrosive environments in Australia.

Further information on intended uses is given in D3.2 below, and in summary:

- (a) Zinc-coated (Type Z) steel is intended for a wide variety of applications requiring added corrosion resistance.
- (b) The zinc/iron alloy coatings (Type ZF) are intended to be painted for most applications, and are predominantly used by the auto industry for body panels.
- (c) Zinc/aluminium (Type ZA) coatings have approximately the same sacrificial protection as zinc with improved corrosion resistance in most environments.
- (d) Zinc/aluminium/magnesium coatings (Type ZM) show superior to high corrosion resistance in many aggressive environments with good galvanic protection and scratch resistance. They are typically used for thicker (>1mm) structural applications.
- (e) Aluminium/zinc alloy coatings (AZ) offer excellent barrier-coating protection combined with some galvanic protection. The corrosion resistance is very high in most environments compared to the previous coatings and long-term durability has been demonstrated. These coatings are widely used on bare and painted roofing and walling.
- (f) Aluminium/zinc/magnesium alloy coatings (AM) offer excellent barrier-coating protection combined with better galvanic protection than the AZ coatings. The corrosion resistance is very high in most environments compared to all the previous coatings. These coatings are designed to offer superior performance to Type AZ in bare and painted roofing and walling.

## D2 FABRICATING CHARACTERISTICS

### D2.1 Skin passing

A light rolling of annealed, normalized or hot-rolled sheet or strip is called 'skin passing', and may be used for one or more of the following purposes:

- (a) To temporarily minimize the occurrence of the condition known as 'stretcher strain' (Luders lines), or fluting, during fabrication of finished parts.
- (b) To obtain the required surface finish for the end use.
- (c) To control shape.

However, material supplied in the skin-passed condition (other than non-ageing or stabilized grades) is subject to strain-age hardening which occurs at room temperature or more rapidly at elevated temperatures, such as during paint baking. Strain-age hardening causes the following changes:

- (i) The appearance of stretcher strain markings on deformation, i.e. a furrowed roughening of the steel surface due to uneven yielding in the first stages of cold deformation.
- (ii) A deterioration of ductility.
- (iii) An increase in yield strength.

Because of the nature of these characteristics, it is essential that the period between final processing at the mill and pressing into a shape be kept to a minimum.

## D2.2 Specific grades

Attention is drawn to the following fabricating characteristics of grades G550, G1, G2 and G3:

- (a) G550: Suitable for corrugating or simple forming; the corrugated sheet is not suitable for curving.
- (b) G1: Normally heavily roller-levelled.
- (c) G2: Reasonably free from fluting but this is not guaranteed; sheet up to and including 1.60 mm thick will lockseam.
- (d) G3: Levelled for control of coil break only; it is not free of fluting and will lockseam in all thicknesses.

## D3 COATING TYPES

### D3.1 Coating classes

It is not possible to specify the absolute relative performance of each of the coating types as performance varies with end use, exposure environment and coating class. For example, for deeply drawn or formed heavy gauge sections where the coating is deformed along with the steel base, coating ductility may also influence coating performance.

### D3.2 Coating types

#### D3.2.1 General

The descriptions in this Paragraph (D3.2) are provided in order to guide users in selecting appropriate coating types for particular applications.

#### D3.2.2 Zinc coating (Types Z and ZF)

Zinc-coated (Type Z) steel is a most commonly used type of coated-steel sheet in manufacturing and construction. It is intended for a range of applications where steel requires the protection of a sacrificial coating in order to extend the life of the article or structure.

Typical applications are: components for building and construction, e.g. steel framing (purlins and girts); steel frame decking; rainwater goods (when painted/coated); automotive components and body panels; tubes and sections; engineering components; domestic appliances (washing machine frames and panels, cooker plates, industrial dryer drums, speaker support etc.); industrial goods (gasoline pumps, tanks, heat exchangers, ventilator housing, trapezoidal profiles, cable tray systems); electrical goods; and components for agricultural machinery.

The zinc/iron alloy coatings (Type ZF) are intended to be painted for most applications. These coatings are characterized by high hardness and brittle behaviour during forming. Type ZF coatings are considered to be easier to spot weld and paint than Type Z coatings and are predominantly used by the auto industry for body panels.

### **D3.2.3** *Zinc/aluminium coating (Type ZA)*

This type of zinc coating has approximately the same sacrificial protection as a Type Z coating with improved corrosion resistance in most environments. Used mostly for applications that require good coating ductility, e.g. deep drawn parts, and in environments requiring moderate to high corrosion resistance.

Typical applications are: components for building and construction (cladding, roofing, partition walls, ceilings, doors, steel framing for residential housing, window frames, snow guards, nail boards, spiral-ducting); automotive components (motor housings, oil filters, cover of shock-absorbers, alternator plates); domestic appliances (washing machine frames and panels, cooker plates, industrial dryer drums, speaker support); industrial goods (gasoline pumps, tanks, heat exchangers, ventilator housing, trapezoidal profiles, cable tray systems); and roadside guardrails.

### **D3.2.4** *Zinc/aluminium/magnesium coating (Type ZM)*

This type of coating has superior to high corrosion resistance in many aggressive environments with good galvanic protection and scratch resistance.

Typical applications are: components for building and construction in aggressive environments (purlins and girts, partition walls, ceilings, doors, steel framing, window frames, snow and wind guards, nail boards, spiral-ducting, steel framed decks, guard railings); automotive components (console box brackets, motor housings, wind shield wiper parts, steering wheel shaft supports, tank heat protectors, surge tank stay etc); domestic appliances (washing machine frames and panels, cooker plates, industrial dryer drums, speaker support); and industrial goods (gasoline pumps, tanks, heat exchangers, ventilator housing, trapezoidal profiles, cable tray systems).

### **D3.2.5** *Aluminium/zinc alloy coating (Type AZ)*

Aluminium/zinc alloy coatings offer excellent barrier-coating protection combined with some galvanic protection. The corrosion resistance is very high in most environments compared to the previous coatings and long-term durability has been demonstrated. Additionally, these coatings have good high temperature resistance and heat reflectivity.

The predominant use of this type of coated steel is in both bare and prepainted applications such as roofing and walling. Other applications of this coated steel are: components for building and construction (cladding, roofing, partition walls, ceilings, doors); rainwater goods; furniture and outdoor cabinetry; unexposed automotive parts; appliances (ovens, heaters); ducting and computer cases.

### **D3.2.6** *Aluminium/zinc/magnesium alloy coating (Type AM)*

Aluminium/zinc alloy coatings offers excellent barrier-coating protection combined with better galvanic protection than the AZ coatings. The corrosion resistance is very high in most environments compared to all the previous coatings. In addition Type AM coatings also show good high temperature resistance and heat reflectivity.

The predominant use of this type of coated steel is in roofing and walling applications in both bare and prepainted forms. Applications of this coated steel include: components for building and construction (cladding, roofing, partition walls, ceilings, doors); furniture and outdoor cabinetry; unexposed automotive parts; appliances (ovens, heaters); rainwater goods; ducting; and computer cases.

## BIBLIOGRAPHY

- AS  
1199 Sampling procedures for inspection by attributes (Series)  
1397 Steel sheet and strip—Hot-dipped zinc-coated or aluminium/zinc-coated  
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2706 Numerical values—Rounding and interpretation of limiting values
- AS/NZS  
4680 Hot-dip galvanized (zinc) coatings on fabricated ferrous articles

NOTES

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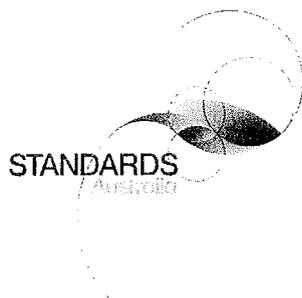
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# Exhibit 4

## Hot-dip zinc-coated steel sheet and strip

### Introduction

This Japanese Industrial Standard has been prepared based on the third edition of ISO 3575 published in 2005 and the fourth edition of ISO 4998 published in 2005 with some modifications of the technical contents.

The portions given sidelines or dotted underlines are the matters in which the contents of the corresponding International Standards have been modified. A list of modifications with the explanations is given in Annex JE. Furthermore, matters in Annex JA to Annex JD are not stated in the corresponding International Standards.

### 1 Scope

This Standard specifies the steel sheets and strips (hereafter referred to as "sheets and coils") and corrugated sheets manufactured by processing steel sheet into the shapes and dimensions specified in JIS G 3316, which are equally coated on both surfaces by hot-dip zinc coating process. The composition by mass fraction is 97 % or over zinc (provided that the aluminium content is usually 0.30 % or less).

NOTE : The International Standards corresponding to this Standard and the symbol of degree of correspondence are as follows:

ISO 3575 : 2005 *Continuous hot-dip zinc-coated carbon steel sheet of commercial and drawing qualities*

ISO 4998 : 2005 *Continuous hot-dip zinc-coated carbon steel sheet of structural quality* (Overall evaluation : MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standards and JIS are IDT (identical), MOD (modified), and NEQ (not equivalent) according to ISO/IEC Guide 21-1.

### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS G 0320 *Standard test method for heat analysis of steel products*

JIS G 0404 *Steel and steel products — General technical delivery requirements*

JIS G 0415 *Steel and steel products — Inspection documents*

JIS G 0594 *Methods of accelerated cyclic corrosion resistance tests for anodic coatings with exposure to salt spray, dry and wet conditions*

JIS G 3316 *Shapes and dimensions of corrugated steel sheets*

JIS H 0401 *Test methods for hot dip galvanized coatings*

NOTE : Corresponding International Standard: **ISO 1460** *Metallic coatings — Hot dip galvanized coatings on ferrous materials — Gravimetric determination of the mass per unit area (MOD)*

JIS H 8502 *Methods of corrosion resistance test for metallic coatings*

JIS K 0119 *General rules for X-ray fluorescence analysis*

JIS K 5600-7-9 *Testing methods for paints — Part 7: Determination of resistance to cyclic corrosion conditions — Section 9: Salt fog/dry/humidity*

JIS Z 2201 *Test pieces for tensile test for metallic materials*

JIS Z 2241 *Method of tensile test for metallic materials*

JIS Z 8401 *Guide to the rounding of numbers*

### 3 Grade, symbol and applicable nominal thickness <sup>1)</sup>

The grade, symbol and applicable nominal thickness shall be as follows.

Note <sup>1)</sup> The nominal thickness refers to the base metal thickness before coating [see 9.1 a)].

- a) The sheets, corrugated sheets and coils shall be classified into 6 grades using hot-rolled sheets and strips (hereafter referred to as "hot-rolled base metal") and into 11 grades using cold-reduced sheets and strips (hereafter referred to as "cold-reduced base metal"), and their grade symbols and applicable nominal thicknesses shall be as given in table 1 and table 2. Corrugated sheets shall be classified into 7 grades of commercial use, commercial use of hard class and commercial use of high strength class in table 2, and their respective symbols shall be as those affixed with symbol W, which stands for corrugated sheet, and the applicable symbol of shape of corrugation specified in **JIS G 3316** to the end of the symbol in table 2 (for those for roofing or architectural siding, after the symbol for roofing or architectural siding).

In this case, the applicable nominal thickness and the coating mass symbol shall be in accordance with Annex JB.

- b) For the sheets and coils used for roofing or architectural siding, the symbol R indicating roofing or the symbol A indicating architectural siding shall be suffixed to the grade symbol in table 2. In this case, the applicable nominal thickness and the coating mass symbol shall be in accordance with Annex JA.

**Table 1 Grade symbol and applicable nominal thickness**  
[using hot-rolled base metal <sup>a)</sup>]

|  |                                 | Unit : mm                                 |
|--|---------------------------------|---|
| Symbol of grade  | Applicable nominal thickness    | Application                               |
| SGHC   | 1.6 or over up to and incl. 6.0 | For commercial use                        |
| SGH340   |                                 | For commercial use of high strength class |
| SGH400   |                                 |   |
| SGH440   |                                 |   |
| SGH490   |                                 |   |
| SGH540   |                                 |   |
| Note <sup>a)</sup> For the nominal thickness of 1.6 mm or over up to and including 3.2 mm, unless the hot-rolled base metal is particularly specified, the cold-reduced base metal which satisfies the specification of the hot-rolled base metal may be used. |                                 |   |

**Table 2 Grade symbol and applicable nominal thickness  
(using cold-reduced base metal)**

|                 |  | Unit : mm   |
|-----------------|--|---|
| Symbol of grade | Applicable nominal thickness <sup>a)</sup> | Application   |
| SGCC            | 0.25 or over up to and incl. 3.2           | For commercial use  |
| SGCH            | 0.11 or over up to and incl. 1.0           | For commercial use of hard class                          |
| SGCD1           | 0.40 or over up to and incl. 2.3           | For drawing use Class 1                                   |
| SGCD2           |  | For drawing use Class 2                                   |
| SGCD3           | 0.60 or over up to and incl. 2.3           | For drawing use Class 3                                   |
| SGCD4           |  | For drawing use Class 4, non-aging property <sup>b)</sup> |
| SGC340          | 0.25 or over up to and incl. 3.2           | For commercial use of high strength class                 |
| SGC400          |  |   |
| SGC440          |  |   |
| SGC490          |  |   |
| SGC570          | 0.25 or over up to and incl. 2.0           |   |

Notes <sup>a)</sup> The nominal thickness other than those listed in this table may be applied upon the agreement between the purchaser and the supplier.  
<sup>b)</sup> The non-aging property refers to the property free from the stretcher strain during working.

#### 4 Chemical composition

For the chemical composition of the sheet, corrugated sheet and coil, the test shall be performed in accordance with 13.1 and the resultant heat analysis values shall be as given in table 3. However, alloying elements other than those in table 3 may be added as required.

**Table 3 Chemical composition**

|                 |           |           |           | Unit : %  |
|-----------------|-----------|-----------|-----------|-----------|
| Symbol of grade | C         | Mn        | P         | S         |
| SGHC            | 0.15 max. | 0.80 max. | 0.05 max. | 0.05 max. |
| SGH340          | 0.25 max. | 1.70 max. | 0.20 max. | 0.05 max. |
| SGH400          | 0.25 max. | 1.70 max. | 0.20 max. | 0.05 max. |
| SGH440          | 0.25 max. | 2.00 max. | 0.20 max. | 0.05 max. |
| SGH490          | 0.30 max. | 2.00 max. | 0.20 max. | 0.05 max. |
| SGH540          | 0.30 max. | 2.50 max. | 0.20 max. | 0.05 max. |
| SGCC            | 0.15 max. | 0.80 max. | 0.05 max. | 0.05 max. |
| SGCH            | 0.18 max. | 1.20 max. | 0.08 max. | 0.05 max. |
| SGCD1           | 0.12 max. | 0.60 max. | 0.04 max. | 0.04 max. |
| SGCD2           | 0.10 max. | 0.45 max. | 0.03 max. | 0.03 max. |
| SGCD3           | 0.08 max. | 0.45 max. | 0.03 max. | 0.03 max. |
| SGCD4           | 0.06 max. | 0.45 max. | 0.03 max. | 0.03 max. |
| SGC340          | 0.25 max. | 1.70 max. | 0.20 max. | 0.05 max. |
| SGC400          | 0.25 max. | 1.70 max. | 0.20 max. | 0.05 max. |
| SGC440          | 0.25 max. | 2.00 max. | 0.20 max. | 0.05 max. |
| SGC490          | 0.30 max. | 2.00 max. | 0.20 max. | 0.05 max. |
| SGC570          | 0.30 max. | 2.50 max. | 0.20 max. | 0.05 max. |

## 5 Coating

### 5.1 Type of coating

The coating shall be classified into 2 types: non-alloyed coating and alloyed coating <sup>2)</sup>.

Note <sup>2)</sup> The alloyed coating refers to the coating obtained in such a way that an alloyed layer of zinc and iron is produced in the entire coating layer by heating after coating.

### 5.2 Coating mass

#### 5.2.1 Coating mass symbol

For coating, both surfaces shall be equally coated in thickness, and the coating mass symbol shall be as given in table 4.

#### 5.2.2 Coating mass

For the coating mass, the test shall be performed in accordance with 13.2.2 and the minimum coating mass shall be as follows. The maximum coating mass (total mass on both surfaces) may be agreed between the purchaser and the supplier.

- a) The coating mass on the sheets, corrugated sheets and coils shall be expressed by the total mass on both surfaces, and the minimum average coating mass at triple spots and the minimum coating mass at a single spot shall be as given in table 4. Here, the minimum average coating mass at triple spots shall apply to the average of the measured values of the coating masses of three test pieces cut from the sample, and the minimum coating mass at a single spot shall apply to the smallest of the measured values of the coating masses of the three test pieces of which the average value is obtained. However, when measuring the coating mass on the sheet according to Annex JD, apply to the average coating mass and the minimum average coating mass obtained according to JD.6.5.

**Table 4 Minimum coating mass (total mass on both surfaces)**

| Type of coating     | Coating mass symbol | Unit : g/m <sup>2</sup>                      |                                     |
|---------------------|---------------------|--|-------------------------------------|
|                     |                     | Minimum average coating mass at triple spots | Minimum coating mass at single spot |
| Non-alloyed coating | Z06 <sup>a)</sup>   | 60   | 51                                  |
|                     | Z08                 | 80   | 68                                  |
|                     | Z10                 | 100  | 85                                  |
|                     | Z12                 | 120  | 102                                 |
|                     | Z14                 | 140  | 119                                 |
|                     | Z18                 | 180  | 153                                 |
|                     | Z20                 | 200  | 170                                 |
|                     | Z22                 | 220  | 187                                 |
|                     | Z25                 | 250  | 213                                 |
|                     | Z27                 | 275  | 234                                 |
|                     | Z35                 | 350  | 298                                 |
|                     | Z37                 | 370  | 315                                 |
|                     | Z45                 | 450  | 383                                 |
|                     | Z60                 | 600  | 510                                 |
| Alloyed coating     | F04 <sup>a)</sup>   | 40   | 34                                  |
|                     | F06                 | 60   | 51                                  |
|                     | F08                 | 80   | 68                                  |
|                     | F10                 | 100  | 85                                  |
|                     | F12                 | 120  | 102                                 |
|                     | F18 <sup>a)</sup>   | 180  | 153                                 |

The coating masses corresponding to Z35, Z37, Z45, Z60, F10, F12 and F18 shall not apply to SGCD1, SGCD2, SGCD3 and SGCD4.  
 Note <sup>a)</sup> Applicable only when agreed between the purchaser and the supplier.

- b) The minimum coating mass at a single spot on either surface on the sheet, corrugated sheet and coil should be 40 % or over of the minimum coating mass at a single spot (total mass on both surfaces).

### 5.3 Coating surface finishes

#### 5.3.1 Type and symbol of surface finish for non-alloyed coating

The type and the symbol of the coating surface finish shall be as given in table 5.

**Table 5 Type and symbol of surface finish for non-alloyed coating**

| Type of coating surface finish | Symbol | Remarks   |
|--------------------------------|--------|---|
| Regular spangle                | R      | A coating having spangles as a result of the unrestricted growth of zinc crystals during normal solidification. |
| Minimized spangle              | Z      | A coating having the spangles obtained by restricting normal spangle formation to a minimum.                    |

### 5.3.2 Skin-pass

Skin-passing to obtain surface smoothness shall be in accordance with the designation by the purchaser. In this case, the symbol shall be S.

### 5.4 Coating adherence

For the coating adherence of the sheets, corrugated sheets and coils to which the non-alloyed coating is applied, when the test is performed in accordance with 13.2.3 under the bend test condition given in table 6 or table 7, there shall be no flaking of the coating on the outside of the bent portion (within an area 7 mm or over from each side of the test piece). However, in the case of the corrugated sheets, apply to the sheets before corrugation.

In addition, unless designated by the purchaser, the coating adherence may be evaluated by the manufacturer in accordance with other evaluation test methods or evaluation criteria in place of the bend test for coating adherence. In this case, the evaluation shall be at least equivalent to the coating adherence by the bend test of table 6 or table 7.

**Table 6 Bend test condition (1)**

| Symbol of grade | Bend angle | Internal spacing of bend (number of sheets of nominal thickness) |          |          |                                     |          |          |
|-----------------|------------|--|----------|----------|-------------------------------------|----------|----------|
|                 |            | Nominal thickness<br>1.6 mm or over to and<br>excl. 3.0 mm       |          |          | Nominal thickness<br>3.0 mm or over |          |          |
|                 |            | Coating mass symbol  |          |          | Coating mass symbol                 |          |          |
|                 |            | Z06 to Z27   | Z35, Z37 | Z45, Z60 | Z06 to Z27                          | Z35, Z37 | Z45, Z60 |
| SGHC            | 180°       | 1  | 2        | 2        | 2                                   | 2        | 2        |
| SGH340          |            | 1  | 1        | 2        | 2                                   | 2        | 3        |
| SGH400          |            | 2  | 2        | 2        | 3                                   | 3        | 3        |
| SGH440          |            | 3  | 3        | 3        | 3                                   | 3        | 3        |
| SGH490          |            |  |          |          |                                     |          |          |
| SGH540          |            |  |          |          |                                     |          |          |

**Table 7 Bend test condition (2)**

| Symbol of grade | Bend angle | Internal spacing of bend (number of sheets of nominal thickness) |          |          |  |          |          |                                     |          |          |
|-----------------|------------|--|----------|----------|--|----------|----------|-------------------------------------|----------|----------|
|                 |            | Nominal thickness<br>Under 1.6 mm                                |          |          | Nominal thickness<br>1.6 mm or over to and<br>excl. 3.0 mm |          |          | Nominal thickness<br>3.0 mm or over |          |          |
|                 |            | Coating mass symbol  |          |          | Coating mass symbol  |          |          | Coating mass symbol                 |          |          |
|                 |            | Z06 to Z27   | Z35, Z37 | Z45, Z60 | Z06 to Z27   | Z35, Z37 | Z45, Z60 | Z06 to Z27                          | Z35, Z37 | Z45, Z60 |
| SGCC            | 180°       | 1  | 1        | 2        | 1  | 2        | 2        | 2                                   | 2        | 2        |
| SGCD1           |            | 1  | —        | —        | 1  | —        | —        | —                                   | —        | —        |
| SGCD2           |            | 0 (Flat on itself)   | —        | —        | 0 (Flat on itself)   | —        | —        | —                                   | —        | —        |
| SGCD3           |            |  |          |          |  |          |          |                                     |          |          |
| SGCD4           |            |  |          |          |  |          |          |                                     |          |          |
| SGC340          |            | 1  | 1        | 2        | 1  | 1        | 2        | 2                                   | 2        | 3        |
| SGC400          |            | 2  | 2        | 2        | 2  | 2        | 2        | 3                                   | 3        | 3        |
| SGC440          |            | 3  | 3        | 3        | 3  | 3        | 3        | 3                                   | 3        | 3        |
| SGC490          |            |  |          |          |  |          |          |                                     |          |          |

## 6 Chemical treatment

The types and symbols of the chemical treatment for the sheets, corrugated sheets and coils shall be as given in table 8. Unless otherwise specified, the non-alloyed coating shall be subjected to the chromate treatment or chromate-free treatment, and the alloyed coating shall be untreated.

The type of chemical treatment other than those in table 8 may be agreed upon between the purchaser and the supplier.

**Table 8 Type and symbol of chemical treatment**

| Type of chemical treatment  | Symbol |
|---|--------|
| Chromate treatment  | C      |
| Phosphate treatment <sup>a)</sup>   | P      |
| Chromate free treatment <sup>b)</sup>   | NC     |
| Chromate free phosphate treatment <sup>c)</sup>   | NP     |
| Untreated   | M      |
| <p>Notes <sup>a)</sup> For phosphate treatment, chromate treatment shall generally be applied on the phosphate-treated surface in order to improve the corrosion resistance.</p> <p><sup>b)</sup> Chromate free treatment refers to the chemical treatment which does not contain the hexavalent chromium.</p> <p><sup>c)</sup> Chromate free phosphate treatment refers to the chemical treatment which does not contain hexavalent chromium applied on the phosphate-treated surface.</p> |        |

## 7 Oiling

The type and the symbol of oiling for the sheets, corrugated sheets and coils shall be as given in table 9. Unless otherwise specified, the non-alloyed coating shall be oiled and the alloyed coating shall be oiled.

**Table 9 Type and symbol of oiling**

| Type of oiling | Symbol |
|----------------|--------|
| Oiled          | ○      |
| Uncoiled       | ×      |

## 8 Mechanical properties

### 8.1 Applicable mechanical properties

Applicable mechanical properties for the sheets, corrugated sheets and coils shall be as given in table 10. However, in the case of the corrugated sheets, apply to the sheets before corrugation.

**Table 10 Applicable mechanical property**

| Symbol of grade  | Bendability <sup>a)</sup> | Tensile test characteristics <sup>b)</sup> |
|--|---------------------------|--|
| SGHC   | ○                         | — <sup>c)</sup>                            |
| SGH340   | ○                         | ○  |
| SGH400   | ○                         | ○  |
| SGH440   | ○                         | ○  |
| SGH490   | ○                         | ○  |
| SGH540   | ○                         | ○  |
| SGCC   | ○ <sup>d)</sup>           | — <sup>c)</sup>                            |
| SGCH   | — <sup>e)</sup>           | — <sup>c)</sup>                            |
| SGCD1  | ○                         | ○  |
| SGCD2  | ○                         | ○  |
| SGCD3  | ○                         | ○  |
| SGCD4  | ○                         | ○  |
| SGC340   | ○                         | ○  |
| SGC400   | ○                         | ○  |
| SGC440   | ○                         | ○  |
| SGC490   | ○                         | ○  |
| SGC570   | — <sup>e)</sup>           | ○  |
| Notes <sup>a)</sup> Apply to the non-alloyed coating and not apply to the alloyed coating.<br><sup>b)</sup> For the nominal thickness under 0.25 mm, the tensile test shall not apply.<br><sup>c)</sup> The tensile test characteristics shall not apply.<br><sup>d)</sup> When used for corrugated sheets, the bendability shall not apply.<br><sup>e)</sup> The bendability shall not apply. |                           |  |

## 8.2 Bendability

For the bendability of the sheets, corrugated sheets and coils to which the non-alloyed coating is applied, when the test is performed in accordance with 13.3.2 under the bend test conditions given in table 6 and table 7, there shall be no cracking (visible to the naked eye) and no fracture of the base metal on the outside of the bent portion (within an area 7 mm or over from each side of the test piece).

NOTE : For the performance of the bend test, see 13.3.2.

## 8.3 Tensile test characteristics

For the tensile test characteristics of the sheets, corrugated sheets and coils, when the test is performed in accordance with 13.3.3, the result shall be as given in table 11 or table 12. However, the values of table 11 or table 12 shall apply to those of outgoing inspection <sup>3)</sup>.

Note <sup>3)</sup> Age-hardening of sheets, corrugated sheets and coils can cause increase in yield point or proof stress and decrease in elongation.

**Table 11 Tensile test characteristics (1)**

| Symbol of grade   | Yield point or proof stress | Tensile strength             | Elongation %                 |                              |                              |                                 |         | Test piece and direction of tensile test                             |
|-------------------|-----------------------------|------------------------------|------------------------------|------------------------------|------------------------------|---------------------------------|---------|--|
|                   |                             |                              | Nominal thickness            |                              |                              |                                 |         |  |
|                   |                             |                              | mm                           |                              |                              |                                 |         |  |
| N/mm <sup>2</sup> | N/mm <sup>2</sup>           | 1.6 or over to and excl. 2.0 | 2.0 or over to and excl. 2.5 | 2.5 or over to and excl. 3.2 | 3.2 or over to and excl. 4.0 | 4.0 or over up to and incl. 6.0 |         |  |
| SGHC              | (205 min.)                  | (270 min.)                   | —                            | —                            | —                            | —                               | —       | No. 5 in rolling direction   |
| SGH340            | 245 min.                    | 340 min.                     | 20 min.                      | 20 min.                      | 20 min.                      | 20 min.                         | 20 min. | No. 5 in rolling direction or perpendicular to the rolling direction |
| SGH400            | 295 min.                    | 400 min.                     | 18 min.                      | 18 min.                      | 18 min.                      | 18 min.                         | 18 min. |  |
| SGH440            | 335 min.                    | 440 min.                     |                              |                              |                              |                                 |         |  |
| SGH490            | 365 min.                    | 490 min.                     |                              |                              |                              |                                 |         |  |
| SGH540            | 400 min.                    | 540 min.                     | 16 min.                      | 16 min.                      | 16 min.                      | 16 min.                         | 16 min. |  |

Values in parentheses are shown for reference. However, they may apply as specified value according to agreement between the purchaser and the supplier.  
NOTE : 1 N/mm<sup>2</sup> = 1 MPa

**Table 12 Tensile test characteristics (2)**

| Symbol of grade     | Yield point or proof stress | Tensile strength               | Elongation %                   |                               |                              |                              |             |         | Test piece and direction of tensile test                             |
|---------------------|-----------------------------|--------------------------------|--------------------------------|-------------------------------|------------------------------|------------------------------|-------------|---------|--|
|                     |                             |                                | Nominal thickness              |                               |                              |                              |             |         |  |
|                     |                             |                                | mm                             |                               |                              |                              |             |         |  |
| N/mm <sup>2</sup>   | N/mm <sup>2</sup>           | 0.25 or over to and excl. 0.40 | 0.40 or over to and excl. 0.60 | 0.60 or over to and excl. 1.0 | 1.0 or over to and excl. 1.6 | 1.6 or over to and excl. 2.5 | 2.5 or over |         |  |
| SGCC                | (205 min.)                  | (270 min.)                     | —                              | —                             | —                            | —                            | —           | —       | No. 5 in rolling direction   |
| SGCH                | —                           | —                              | —                              | —                             | —                            | —                            | —           | —       |  |
| SGCD1               | —                           | 270 min.                       | —                              | 34 min.                       | 36 min.                      | 37 min.                      | 38 min.     | —       |  |
| SGCD2               | —                           | 270 min.                       | —                              | 36 min.                       | 38 min.                      | 39 min.                      | 40 min.     | —       |  |
| SGCD3               | —                           | 270 min.                       | —                              | 38 min.                       | 40 min.                      | 41 min.                      | 42 min.     | —       |  |
| SGCD4 <sup>a)</sup> | —                           | 270 min.                       | —                              | 40 min.                       | 42 min.                      | 43 min.                      | 44 min.     | —       |  |
| SGC340              | 245 min.                    | 340 min.                       | 20 min.                        | 20 min.                       | 20 min.                      | 20 min.                      | 20 min.     | 20 min. | No. 5 in rolling direction or perpendicular to the rolling direction |
| SGC400              | 295 min.                    | 400 min.                       | 18 min.                        | 18 min.                       | 18 min.                      | 18 min.                      | 18 min.     | 18 min. |  |
| SGC440              | 335 min.                    | 440 min.                       | 18 min.                        | 18 min.                       | 18 min.                      | 18 min.                      | 18 min.     | 18 min. |  |
| SGC490              | 365 min.                    | 490 min.                       | 16 min.                        | 16 min.                       | 16 min.                      | 16 min.                      | 16 min.     | 16 min. |  |
| SGC570              | 560 min.                    | 570 min.                       | —                              | —                             | —                            | —                            | —           | —       |  |

Values in parentheses are shown for reference. However, they may apply as specified value according to the agreement between the purchaser and the supplier.  
NOTE 1 SGCH is a material not subjected to annealing, usually having a Rockwell hardness of 85 HRB or more or a Vickers hardness of 170 HV or more.  
NOTE 2 1 N/mm<sup>2</sup> = 1 MPa  
Notes <sup>a)</sup> For the sheet and coil of SGCD4, the stretcher strain shall not be generated when working is performed during 6 months after manufacturing.

## 9 Dimensions and tolerances

### 9.1 Expression of dimensions

The dimensions of sheets, corrugated sheets and coils shall be expressed as follows.

- a) For the thickness of sheets, corrugated sheets and coils, the thickness of the base metal before coating shall be regarded as the nominal thickness and the thickness of the base metal after coating shall be regarded as the product thickness.
- b) The dimensions of sheets and corrugated sheets shall be expressed by nominal thickness, width and length in millimetres.
- c) The dimensions of coil shall be expressed by nominal thickness and width in millimetres. When the mass of coil is the theoretical mass, the length shall be expressed in metres.

### 9.2 Standard dimensions

The standard dimensions of sheets and coils shall be as follows. The standard nominal thickness of corrugated sheets, standard width and length before corrugation shall be in accordance with Annex JB. Further, the standard length and width of corrugated sheets after corrugation shall be in accordance with JIS G 3316.

- a) **Standard nominal thickness** The standard nominal thickness of sheets and coils shall be as given in table 13.

**Table 13 Standard nominal thickness**

Unit : mm

| Standard nominal thickness |        |        |      |      |      |      |      |      |     |     |     |
|----------------------------|--------|--------|------|------|------|------|------|------|-----|-----|-----|
| (0.27)                     | (0.30) | (0.35) | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 | 0.90 | 1.0 | 1.2 | 1.4 |
| 1.6                        | 1.8    | 2.0    | 2.3  | 2.8  | 3.2  | 3.6  | 4.0  | 4.5  | 5.0 | 5.6 | 6.0 |

Values in parentheses shall apply to the coating mass or more coatings corresponding to the non-alloyed Z18. Upon the agreement between the purchaser and the supplier, the thicknesses of 0.65 mm and 0.75 mm may serve as the standard nominal thicknesses.

- b) **Standard width and standard length of sheet** The standard width of sheets and coils, and the standard length of sheets shall be as given in table 14.

**Table 14 Standard width and standard length of sheet**

Unit : mm

| Standard width | Standard length of sheet |       |       |       |       |       |       |
|----------------|--------------------------|-------|-------|-------|-------|-------|-------|
| 762            | 1 829                    | 2 134 | 2 438 | 2 743 | 3 048 | 3 353 | 3 658 |
| 914            | 1 829                    | 2 134 | 2 438 | 2 743 | 3 048 | 3 353 | 3 658 |
| 1 000          | 2 000                    |       |       |       |       |       |       |
| 1 219          | 2 438                    | 3 048 | 3 658 |       |       |       |       |
| 1 524          | 3 048                    |       |       |       |       |       |       |
| 1 829          | 3 658                    |       |       |       |       |       |       |

As for the coil, 610 mm shall also be regarded as the standard width in addition to those given in this table.

### 9.3 Dimensional tolerances

#### 9.3.1 Tolerances on product thickness

Tolerances on the product thickness of sheets, corrugated sheets and coils shall be as follows.

- Tolerances on the product thickness shall apply to the value of the nominal thickness rounded to three decimal places plus the equivalent thickness of the coating given in table 15 rounded to two decimal places in accordance with rule A of **JIS Z 8401**.
- Tolerances on the product thickness shall be as given in table 16, table 17 or table 18.
- The product thickness shall be measured at any point 25 mm or over from the side edge (the end in the width direction).
- They shall not apply to the irregular portions such as the welds in a coil.

**Table 15 Equivalent coating thickness**

Non-alloyed coating

Unit : mm

|                              |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Coating mass symbol          | Z06   | Z08   | Z10   | Z12   | Z14   | Z18   | Z20   | Z22   | Z25   | Z27   | Z35   | Z37   | Z45   | Z60   |
| Equivalent coating thickness | 0.013 | 0.017 | 0.021 | 0.026 | 0.029 | 0.034 | 0.040 | 0.043 | 0.049 | 0.054 | 0.064 | 0.067 | 0.080 | 0.102 |

Alloyed coating

|                              |       |       |       |       |       |       |
|------------------------------|-------|-------|-------|-------|-------|-------|
| Coating mass symbol          | F04   | F06   | F08   | F10   | F12   | F18   |
| Equivalent coating thickness | 0.008 | 0.013 | 0.017 | 0.021 | 0.026 | 0.034 |

**Table 16 Tolerances on product thickness (applicable to SGHC)**

Unit : mm

| Nominal width                  | Width       |                                  |                                  |                                     |
|--------------------------------|-------------|----------------------------------|----------------------------------|-------------------------------------|
|                                | Under 1 200 | 1 200 or over to and excl. 1 500 | 1 500 or over to and excl. 1 800 | 1 800 or over up to and incl. 2 300 |
| 1.60 or over to and excl. 2.00 | ± 0.17      | ± 0.18                           | ± 0.19                           | ± 0.22 <sup>a)</sup>                |
| 2.00 or over to and excl. 2.50 | ± 0.18      | ± 0.20                           | ± 0.22                           | ± 0.26 <sup>a)</sup>                |
| 2.50 or over to and excl. 3.15 | ± 0.20      | ± 0.22                           | ± 0.25                           | ± 0.27                              |
| 3.15 or over to and excl. 4.00 | ± 0.22      | ± 0.24                           | ± 0.27                           | ± 0.28                              |
| 4.00 or over to and excl. 5.00 | ± 0.25      | ± 0.27                           | —                                | —                                   |
| 5.00 or over to and excl. 6.00 | ± 0.27      | ± 0.29                           | —                                | —                                   |
| 6.00                           | ± 0.30      | ± 0.31                           | —                                | —                                   |

Note <sup>a)</sup> Applicable to those of width under 2 000 mm.

**Table 17 Tolerances on product thickness (applicable to SGH340, SGH400, SGH440, SGH490 and SGH540)**

Unit : mm

| Nominal thickness                 | Width       |                                  |
|-----------------------------------|-------------|----------------------------------|
|                                   | Under 1 600 | 1 600 or over to and excl. 2 000 |
| 1.60 or over to and excl. 2.00    | ± 0.20      | ± 0.24                           |
| 2.00 or over to and excl. 2.50    | ± 0.21      | ± 0.26                           |
| 2.50 or over to and excl. 3.15    | ± 0.23      | ± 0.30                           |
| 3.15 or over to and excl. 4.00    | ± 0.25      | ± 0.35                           |
| 4.00 or over to and excl. 5.00    | ± 0.46      | —                                |
| 5.00 or over up to and incl. 6.00 | ± 0.51      | —                                |

**Table 18 Tolerances on product thickness (applicable to SGCC, SGCH, SGCD1 to SGCD4 and SGC340 to SGC570)**

Unit : mm

| Nominal thickness                 | Width     |                                |                                  |                                  |               |
|-----------------------------------|-----------|--------------------------------|----------------------------------|----------------------------------|---------------|
|                                   | Under 630 | 630 or over to and excl. 1 000 | 1 000 or over to and excl. 1 250 | 1 250 or over to and excl. 1 600 | 1 600 or over |
| Under 0.25 <sup>a)</sup>          | (± 0.04)  | (± 0.04)                       | (± 0.04)                         | —                                | —             |
| 0.25 or over to and excl. 0.40    | ± 0.05    | ± 0.05                         | ± 0.05                           | ± 0.06                           | —             |
| 0.40 or over to and excl. 0.60    | ± 0.06    | ± 0.06                         | ± 0.06                           | ± 0.07                           | ± 0.08        |
| 0.60 or over to and excl. 0.80    | ± 0.07    | ± 0.07                         | ± 0.07                           | ± 0.07                           | ± 0.08        |
| 0.80 or over to and excl. 1.00    | ± 0.07    | ± 0.07                         | ± 0.08                           | ± 0.09                           | ± 0.10        |
| 1.00 or over to and excl. 1.25    | ± 0.08    | ± 0.08                         | ± 0.09                           | ± 0.10                           | ± 0.12        |
| 1.25 or over to and excl. 1.60    | ± 0.09    | ± 0.10                         | ± 0.11                           | ± 0.12                           | ± 0.14        |
| 1.60 or over to and excl. 2.00    | ± 0.11    | ± 0.12                         | ± 0.13                           | ± 0.14                           | ± 0.16        |
| 2.00 or over to and excl. 2.50    | ± 0.13    | ± 0.14                         | ± 0.15                           | ± 0.16                           | ± 0.18        |
| 2.50 or over to and excl. 3.15    | ± 0.15    | ± 0.16                         | ± 0.17                           | ± 0.18                           | ± 0.21        |
| 3.15 or over up to and incl. 3.20 | ± 0.17    | ± 0.18                         | ± 0.20                           | ± 0.21                           | —             |
| Over 3.20 <sup>a)</sup>           | (± 0.17)  | (± 0.18)                       | (± 0.20)                         | (± 0.21)                         | —             |

The tolerances in parentheses are shown for reference. In accordance with the agreement between the purchaser and the supplier, however, these values may be applied as specified values.

Note <sup>a)</sup> Nominal thickness applied upon the agreement between the purchaser and the supplier.

### 9.3.2 Tolerances on width

The tolerances on the width of sheets and coils shall be as given tables 19, 20 and 21. Table 19 applies to those cut by the normal method, table 20 to those cut again or precisely cut and table 21 to those slit. The width shall be measured at a normal position in a coil and at any position in the sheet. The tolerances on width in table

20 may shift to the minus side within the same range as the overall range of tolerances specified in table 20. The upper limits of tolerances, however, shall not be less than zero.

However, tolerances on the width of corrugated sheets after corrugation shall be in accordance with **JIS G 3316**.

**Table 19 Tolerances on width (1)**

Unit : mm

| Width          | Applicable grade symbol   |                           | SGCC, SGCH,<br>SGCD1 to SGCD4,<br>SGC340 to SGC570 |
|----------------|---------------------------|---------------------------|--|
|                | Tolerance A <sup>a)</sup> | Tolerance B <sup>a)</sup> |  |
| 1 500 or under | + 25                      | + 10                      | + 7  |
|                | 0                         | 0                         | 0  |
| Over 1 500     |                           |                           | + 10   |
|                |                           |                           | 0  |

Note <sup>a)</sup> Generally, tolerance A is applied to the mill edge and tolerance B is applied to the cut edge.

**Table 20 Tolerances on width (2)**

Unit : mm

| Width       |               |
|-------------|---------------|
| Under 1 250 | 1 250 or over |
| + 3         | + 4           |
| 0           | 0             |

**Table 21 Tolerances on width (3)**

Unit : mm

| Nominal thickness              | Width     |                                 |                                 |                                 |
|--------------------------------|-----------|---------------------------------|---------------------------------|---------------------------------|
|                                | Under 160 | 160 or over to<br>and excl. 250 | 250 or over to<br>and excl. 400 | 400 or over to and<br>excl. 630 |
| Under 0.25 <sup>a)</sup>       | (±0.15)   | (±0.20)                         | (±0.25)                         | (±0.30)                         |
| 0.25 or over to and excl. 0.60 | ±0.15     | ±0.20                           | ±0.25                           | ±0.30                           |
| 0.60 or over to and excl. 1.00 | ±0.20     | ±0.25                           | ±0.25                           | ±0.30                           |
| 1.00 or over to and excl. 1.60 | ±0.20     | ±0.30                           | ±0.30                           | ±0.40                           |
| 1.60 or over to and excl. 2.50 | ±0.25     | ±0.35                           | ±0.40                           | ±0.50                           |
| 2.50 or over to and excl. 3.20 | ±0.30     | ±0.40                           | ±0.45                           | ±0.50                           |
| 3.20 or over                   | ±0.50     | ±0.50                           | ±0.50                           | ±0.50                           |

The tolerances in parentheses are shown for reference. In accordance with the agreement between the purchaser and the supplier, however, these values may be applied as specified values.

Note <sup>a)</sup> Nominal thickness applied upon the agreement between the purchaser and the supplier.

### 9.3.3 Tolerances on length

The tolerances on the length of sheets and corrugated sheets shall be as given in table 22. The length shall be measured at any position in the sheet and corrugated sheet.

**Table 22 Tolerances on length**

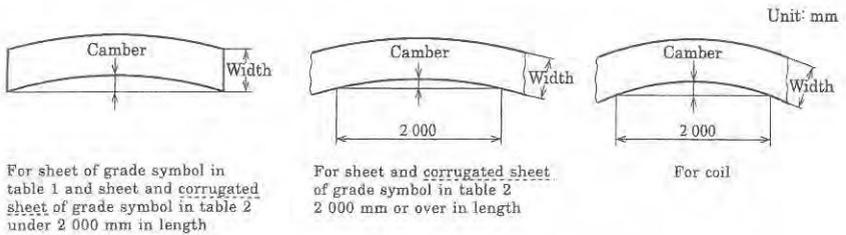
| Unit : mm            |  |
|----------------------|--|
| Tolerances on length |  |
| + 15                 |  |
| 0                    |  |

**10 Shapes**

**10.1 Camber**

The application of camber for the sheets, corrugated sheets and coils shall be as shown in figure 1. However, in the case of corrugated sheets, they shall be applied to the sheets before corrugation. The maximum camber of the sheets, corrugated sheets and coils shall be as given in table 23 or table 24. However, the camber shall not apply to the irregular portions in a coil. The measurement of camber may be omitted<sup>4)</sup>, however, when particularly specified by the purchaser, the measurement shall be performed.

Note <sup>4)</sup> The measurement of camber may be omitted by the judgement of the manufacturer on the precondition that camber shall satisfy the specified value.



**Figure 1 Application of camber**

**Table 23 Maximum value of camber (applicable for SGHC, SGH340, SGH400, SGH440, SGH490 and SGH540)**

| Width                          | Sheet       |                                  |               | Coil                  |
|--------------------------------|-------------|----------------------------------|---------------|-----------------------|
|                                | Length      |                                  |               |                       |
|                                | Under 2 500 | 2 500 or over to and excl. 4 000 | 4 000 or over |                       |
| Under 630                      | 5           | 8                                | 12            | 5 in any 2 000 length |
| 630 or over to and excl. 1 000 | 4           | 6                                | 10            |                       |
| 1 000 or over                  | 3           | 5                                | 8             |                       |

**Table 24 Maximum value of camber (applicable for SGCC, SGCH, SGCD1 to SGCD4 and SGC340 to SGC570)**

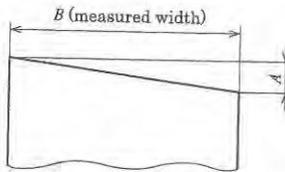
| Width       | Sheet and corrugated sheet |                       | Coil |
|-------------|----------------------------|-----------------------|------|
|             | Length                     |                       |      |
|             | Under 2 000                | 2 000 or over         |      |
| Under 630   | 4                          | 4 in any 2 000 length |      |
| 630 or over | 2                          | 2 in any 2 000 length |      |

Unit : mm

**10.2 Squareness**

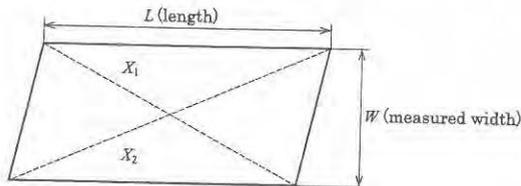
The squareness of the sheets and corrugated sheets shall be in accordance with either of the following. For the corrugated sheets, however, it applies to the sheet before corrugation. In addition, if any doubt arises, a) shall apply.

- a) **Method using perpendicular line** The squareness of sheets and corrugated sheets is expressed by the ratio  $A/B$ , where  $A$  indicates the distance between a perpendicular line which is dropped at a corner point of one side and another corner point of opposite side, and  $B$  indicates the length of the perpendicular line, and the value shall not exceed 1.0 %.



**Figure 2 Squareness of sheet or corrugated sheet (method using perpendicular line)**

- b) **Method using diagonal lines** Half of the absolute value of the difference  $(|X_1 - X_2|/2)$  between each length of two diagonal lines ( $X_1$  and  $X_2$  in figure 3) of the sheet or corrugated sheet is obtained, and the value shall not exceed 0.7 % of the measured width of the sheet and corrugated sheet.



**Figure 3 Squareness of sheet or corrugated sheet (method using diagonal lines)**

### 10.3 Flatness

The flatness of the sheets and coils shall be as following.

- a) **Flatness of sheets** The flatness of the sheets shall be as given in table 25 or table 26. The flatness shall be measured with a sheet lying on a level block and its value shall be obtained by subtracting the product thickness from the maximum strain and shall apply to the upper surface of the sheet.

**Table 25 Flatness for the sheet (applicable to SGHC, SGH340, SGH400, SGH440, SGH490 and SGH540)**

Unit : mm

| Nominal thickness              | Width       |                                  |                                  |                                     |
|--------------------------------|-------------|----------------------------------|----------------------------------|-------------------------------------|
|                                | Under 1 250 | 1 250 or over to and excl. 1 600 | 1 600 or over to and excl. 2 000 | 2 000 or over up to and incl. 2 300 |
| 1.60 or over to and excl. 3.15 | 16 max.     | 18 max.                          | 20 max.                          | —                                   |
| 3.15 or over to and excl. 4.00 | 16 max.     |                                  |                                  | —                                   |
| 4.00 or over to and excl. 6.00 | 14 max.     |                                  |                                  | 24 max.                             |
| 6.00                           | 13 max.     |                                  |                                  | 21 max.                             |

**Table 26 Flatness for the sheet (applicable to SGCC, SGCH, SGCD1 to SGCD4 and SGC340 to SGC570)**

Unit : mm

| Width                            | Type of strain <sup>a)</sup> |           |               |
|----------------------------------|------------------------------|-----------|---------------|
|                                  | Bow, wave                    | Edge wave | Centre buckle |
| Under 1 000                      | 12 max.                      | 8 max.    | 6 max.        |
| 1 000 or over to and excl. 1 250 | 15 max.                      | 9 max.    | 8 max.        |
| 1 250 or over to and excl. 1 600 | 15 max.                      | 11 max.   | 8 max.        |
| 1 600 or over                    | 20 max.                      | 13 max.   | 9 max.        |

Note <sup>a)</sup> According to its shape and location of occurrence, the strain is categorized as follows.  
 Bow: curving of the whole steel sheet, either in the rolling direction or in the direction transverse to the rolling direction  
 Wave: rippling in rolling direction of the steel sheet  
 Edge wave: wave appearing on the edge of steel sheet (end part in the width direction)  
 Centre buckle: wave appearing on the centre part of the steel sheet

- b) **Flatness of coils** The flatness of coils shall be as given in table 25 or 26, provided that it is not applicable to the bow. Also, it shall not apply to the irregular parts of the coil. The flatness of coils shall be inspected on the inspection station installed on the production line. When the measurement value is necessary, the measurement including the measurement method shall be reported upon the agreement between the purchaser and the manufacturer.

The measurement of flatness of coils may be omitted <sup>5)</sup>.

Note <sup>5)</sup> The omission of the measurement of flatness based on the judgement of the manufacturer is permissible on the precondition that the flatness shall satisfy the specified value.

## 11 Mass and tolerances thereof

### 11.1 Mass of sheet and corrugated sheet

The mass of sheets and corrugated sheets shall usually be given in the theoretical mass in kilogrammes.

### 11.2 Mass of coil

The mass of coils shall be given in either the actual or the theoretical mass in kilogrammes.

### 11.3 Calculation method of mass

The calculation method of the mass of sheets, corrugated sheets and coils shall be as given in table 27.

Table 27 Calculation method of mass

| Calculation order  |   | Calculation method  | Number of figures in resultant values <sup>a)</sup> |
|--|---|---|---|
| Basic mass of base metal kg/(mm·m <sup>2</sup> )   |   | 7.85 <sup>b)</sup>  | —   |
| Unit mass of base metal kg/m <sup>2</sup>  |   | Basic mass of base metal [kg/(mm·m <sup>2</sup> )] × nominal thickness (mm)                             | Rounded off to 4 significant figures.               |
| Unit mass after coating kg/m <sup>2</sup>  |   | Unit mass of base metal (kg/m <sup>2</sup> ) + coating mass constant (kg/m <sup>2</sup> ) <sup>c)</sup> | Rounded off to 4 significant figures.               |
| Sheet and corrugated sheet   | Area of sheet and corrugated sheet <sup>d)</sup> m <sup>2</sup> | Width (mm) × length (mm) × 10 <sup>-6</sup>   | Rounded off to 4 significant figures.               |
|  | Mass of a single sheet kg                                       | Unit mass after coating (kg/m <sup>2</sup> ) × area (m <sup>2</sup> )                                   | Rounded off to 3 significant figures.               |
|  | Mass of a single bundle <sup>e)</sup> kg                        | Mass of single sheet (kg) × number of sheets in a single bundle of the same dimensions                  | Rounded off to integral number of kg.               |
|  | Total mass kg   | Total mass of each bundle (kg)  | Integral number of kg.                              |
| Coil   | Unit mass of coil kg/m  | Unit mass after coating (kg/m <sup>2</sup> ) × width (mm) × 10 <sup>-3</sup>                            | Rounded off to 3 significant figures.               |
|  | Mass of a single coil kg  | Unit mass of coil (kg/m) × length (m)   | Rounded off to integral number of kg.               |
|  | Total mass kg   | Total mass of each coil (kg)  | Integral number of kg.                              |
| Notes <sup>a)</sup> Rounding off of the numerical values shall be in accordance with rule A of JIS Z 8401.   |   |   |   |
| <sup>b)</sup> Basic mass of base metal per thickness of 1 mm × area of 1 m <sup>2</sup>  |   |   |   |
| <sup>c)</sup> The coating mass constants shall be as given in table 28.  |   |   |   |
| <sup>d)</sup> The width dimensions to be used for the calculation of the area of the corrugated sheet shall be those before corrugation.   |   |   |   |
| <sup>e)</sup> The number of sheets, when the bundle mass is specified, shall be obtained by dividing the specified mass by the mass of a single sheet of the same shape, dimensions and coating mass, to be rounded off to an integral number. |   |   |   |

**Table 28 Coating mass constants for mass calculation**

| Non-alloyed coating   |       |       |       |       |       |       |       |       |       |       |       |       | Unit : kg/m <sup>2</sup> |       |
|-----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------------------------|-------|
| Coating mass symbol   | Z06   | Z08   | Z10   | Z12   | Z14   | Z18   | Z20   | Z22   | Z25   | Z27   | Z35   | Z37   | Z45                      | Z60   |
| Coating mass constant | 0.090 | 0.120 | 0.150 | 0.183 | 0.203 | 0.244 | 0.285 | 0.305 | 0.350 | 0.381 | 0.458 | 0.481 | 0.565                    | 0.722 |

**Alloyed coating** Unit : kg/m<sup>2</sup>

| Coating mass symbol   | F04   | F06   | F08   | F10   | F12   | F18   |
|-----------------------|-------|-------|-------|-------|-------|-------|
| Coating mass constant | 0.060 | 0.090 | 0.120 | 0.150 | 0.183 | 0.244 |

#### 11.4 Tolerances on theoretical mass of sheet and corrugated sheet

Tolerances on the theoretical mass of sheets and corrugated sheets, which are expressed as the percentage obtained by dividing the difference between the theoretical mass obtained in accordance with 11.3 and the actual mass by the theoretical mass, shall be as given in table 29.

**Table 29 Tolerances on mass**

| Theoretical mass of a single lot <sup>a)</sup><br>kg  | Tolerance<br>% |
|---|----------------|
| Under 600   | ± 10           |
| 600 or over to and excl. 2 000  | ± 7.5          |
| 2 000 or over   | ± 5            |
| Note <sup>a)</sup> Calculation shall be made regarding one lot of sheets of the same quality, shape, dimensions and coating mass. |                |

## 12 Appearance

The sheets, corrugated sheets and coils shall be free from defects detrimental to use. However, since it is difficult to detect defects extend the entire length of coils in general, and it has no opportunity to remove defects, the coil may contain some irregular portions or such weld. When the treatment for irregular portion is needed, the method may be in accordance with the agreement between the purchaser and the supplier.

In addition, unless otherwise specified, defects on the surface shall be applied to the one-sided surface <sup>6)</sup> of sheets, corrugated sheets and coils.

NOTE: Defects include hole, lamination, surface flaw, etc.

Note <sup>6)</sup> The one-sided surface, usually, refers to a surface of the upper side in packaging for the sheets and corrugated sheets and the outside surface of coils for the coils.

### 13 Tests

#### 13.1 Analysis test

##### 13.1.1 General matter of analysis test and sampling method of specimen

The chemical composition of the sheets, corrugated sheets and coils shall be obtained by the heat analysis, and the general matters of analysis test and the sampling method of specimens shall be in accordance with clause 8 of JIS G 0404.

##### 13.1.2 Analytical method

The analytical method shall be in accordance with JIS G 0320.

#### 13.2 Coating test

##### 13.2.1 Sampling method

The sampling method for each product of same dimensions and coating mass shall be as follows.

For the corrugated sheet, the sample shall be taken from the sheet before corrugation.

- a) For the continuously coated coil or the cut length thereof, one sample shall be taken from every 50 t or fraction thereof.
- b) For the sheet of which coating is applied to the base metal after cut to specified lengths, one sample shall be taken from every 3 000 sheets or fraction thereof.

##### 13.2.2 Coating mass test

The coating mass test shall be as follows.

- a) **Test method** The coating mass shall be measured on both surfaces and the test method shall be in accordance with any one of 5.2 of JIS H 0401, Annex JC or Annex JD. However, when any doubt arises, it shall be in accordance with 5.2 of JIS H 0401.

In the case of the method of Annex JD, measure each 50 t of the same dimension, same coating mass and fraction thereof.

- b) **Sampling position and size and number of test pieces** The sampling position and size and number of test pieces shall be as follows;
  - 1) The sampling position and number of test pieces in the case of the method in 5.2 of JIS H 0401 shall be in accordance with JC.5.2. The size of the test piece shall be 1 200 mm<sup>2</sup> or over.
  - 2) The sampling position and size and number of test pieces in the case of the method in Annex JC shall be in accordance with JC.5.
  - 3) In the case of the method in Annex JD, the test piece shall not be sampled and measure the coil directly.

##### 13.2.3 Adhesiveness test of the coating

The adhesiveness test of the coating by the bend test shall be as follows;

- a) **Sampling position and size of test piece** The sampling position of test pieces shall be arbitrary in the sample. The test piece shall have a width of 75 mm to 125 mm and a suitable length of about twice the width. Unless otherwise specified, one test piece shall be taken from the sample parallel to the rolling direction of the base metal.

- b) **Bending of test piece** The test piece shall be bent manually with a vise at 180° in the longitudinal direction of the test piece as shown in figure 4 with sandwiching the number of sheets specified in tables 6 or 7 as internal spacing. When a hand vise is not available, other suitable means of testing may be adopted.

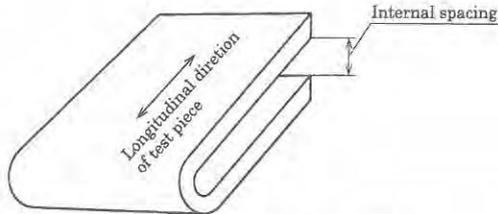


Figure 4 Bending direction

### 13.2.4 Corrosion resistance test of coating

The corrosion resistance test of coating shall be performed by any one of the methods clause 8 of JIS H 8502, Annex 1 of JIS K 5600-7-9 or JIS G 0594.

This test shall be performed in accordance with the agreement between the purchaser and the supplier, and the evaluation criteria (setting of reference value and characteristics value) may be agreed between the purchaser and the supplier.

NOTE : In the corrosion resistance test of coating, in general, the test result is often reported without specifying evaluation criteria.

### 13.3 Mechanical test

#### 13.3.1 General matter

The general matters of the mechanical test shall be in accordance with clause 7 and clause 9 of JIS G 0404. In this case, the sampling method shall be Class A of 7.6 of JIS G 0404, and for corrugated sheets the sample shall be taken from the sheet before corrugation. The number and the sampling position of the test pieces shall be as follows.

- a) **Number of test pieces** One bend test piece and one tensile test piece shall be taken from every 50 t or fraction thereof of the products of the same grade, thickness and coating mass, respectively.
- b) **Sampling position of test piece** The centre of the test piece shall be located at a position of 1/4 width or near the position.

#### 13.3.2 Bend test

The bend test shall be in accordance with 13.2.3.

The bend test may be omitted <sup>7)</sup>, however when particularly designated by the purchaser, the test shall be performed.

Note <sup>7)</sup> The test may be omitted by the judgement of the manufacturer on the precondition that bendability shall satisfy the specified value.

### 13.3.3 Tensile test

The tensile test shall be as follows.

- a) **Test piece** The test piece shall be No. 5 test piece of JIS Z 2201, and one shall be taken from the sample in the direction as given in table 11 and table 12.
- b) **Test method** The test method shall be in accordance with JIS Z 2241.
- c) **Thickness used for calculation of yield point or proof stress, and tensile strength** The thickness used for calculation of yield point or proof stress, and tensile strength shall be in accordance with any of the following.
  - actual measured thickness after removing the coating layer
  - thickness obtained by subtracting the equivalent coating thickness from the actual measured thickness including the coating layer
  - thickness obtained by subtracting the coating thickness<sup>8)</sup> converted by the actual measured coating mass from the actual measured thickness including the coating layer

Note <sup>8)</sup> The converted coating thickness is obtained by dividing the measured coating mass by the coating density (7.14 g/cm<sup>3</sup> for non-alloyed coating and 7.21 g/cm<sup>3</sup> for alloyed coating) and by rounding off to three decimal places expressing in mm.

## 14 Inspection and re-inspection

### 14.1 Inspection

The inspection shall be as follows.

- a) Chemical composition shall comply with clause 4.
- b) Coating mass shall comply with 5.2.
- c) Coating adherence shall comply with 5.4.
- d) Mechanical properties shall comply with clause 8.
- e) Dimensions shall comply with clause 9.
- f) Shapes shall comply with clause 10.
- g) Mass shall comply with clause 11.
- h) Appearance shall comply with clause 12.

### 14.2 Re-inspection

For the sheets, corrugated sheets and coils having failed to meet the requirements of the coating mass test, the coating adherence test, the bend test or the tension test, retests may be performed for acceptance in accordance with 9.8 of JIS G 0404.

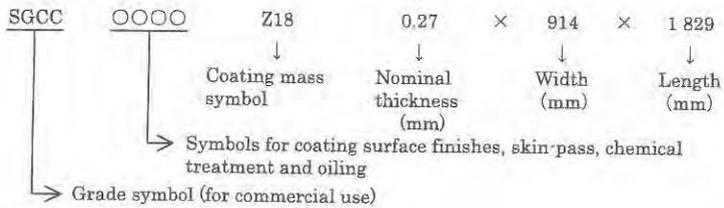
## 15 Marking

For each package or bundle of the sheets, corrugated sheets and coils that have passed the inspection, the following items shall be legibly marked by a suitable means. When agreed between the purchaser and the supplier, the following items may be marked on individual sheet and corrugated sheet by a suitable means.

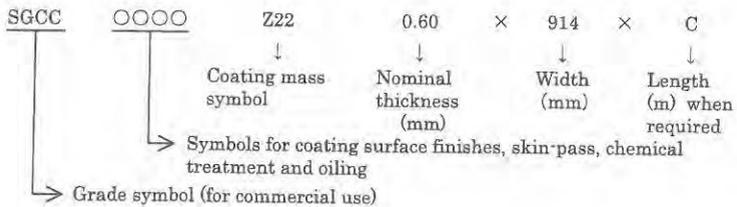
- a) Grade symbol
- b) Symbol for roofing, symbol for architectural siding, and/or symbol for the corrugated sheet (including the shape symbol for the corrugated sheet). These symbols shall be marked after the grade symbol.
- c) Symbol for surface finish, symbol for skin-pass treatment and/or symbol for chemical treatment, symbol for oiling. These symbols shall be marked when designated by the purchaser.
- d) Coating mass symbol
- e) Dimensions (See 9.1. Only the nominal thickness for one sheet.)
- f) Identification number of product
- g) Number of sheets or mass (May be omitted for one sheet.)
- h) Manufacturer's name or its identifying brand

Marking shall be as shown in the following examples.

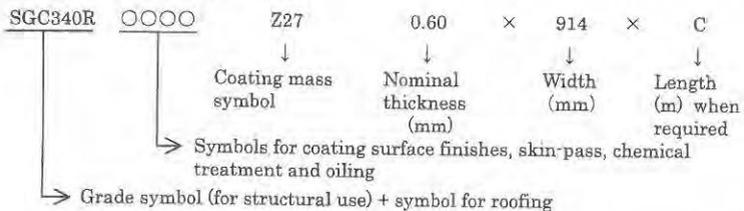
**Example 1 Sheet**



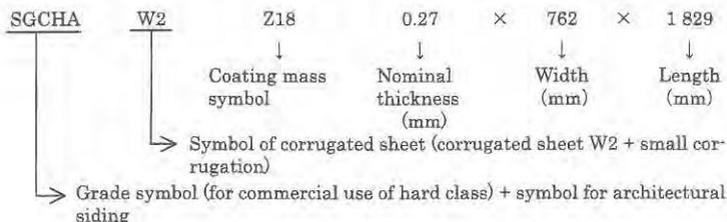
**Example 2 Coil**



**Example 3 Coil for roofing**



**Example 4** Corrugated sheet for architectural siding using sheet of commercial use of hard class



**16 Items to be confirmed at the time of order**

The purchaser and the supplier should include the following information in an inquiry sheet and an order sheet in order to designate the requirements according to this Standard properly.

- a) Grade symbol (table 1 and table 2)
- b) Dimensions (For standard nominal thickness, standard width and standard length, table 13 and table 14. For corrugated sheets, table JB.2 and JB.3 and JIS G 3316)
- c) Symbol for coating surface finish (table 5)
- d) Skin-pass treatment
- e) Coating mass symbol (table 4)
- f) Symbol for chemical treatment (table 8)
- g) Symbol for oiling (table 9)
- h) Maximum mass and minimum mass of one bundle or one coil of product
- i) Total mass ordered
- j) Tolerance on width (table 19 and table 20 or table 21)
- k) Internal diameter and external diameter for coil
- l) Application, processing method, etc. when possible

**17 Report**

When there is a request from the purchaser beforehand, the manufacturer shall submit the inspection document to the purchaser. In this case, the report shall conform to clause 13 in JIS G 0404. In the case where there is no special designation at the time of order, the type of inspection document shall be in accordance with 2.3 or 3.1.B of table 1 in JIS G 0415.

## Annex JA (normative)

### Nominal thickness and coating mass symbol of sheet and coil for roofing and architectural siding

#### JA.1 Scope

This Annex specifies the nominal thickness and the coating mass symbol applicable to sheets and coils (using cold-reduced base metal) for roofing and architectural siding.

#### JA.2 Applicable nominal thickness and coating mass symbol

The nominal thickness and the coating mass symbol applicable to the sheet and coil for roofing and architectural siding shall be as given in table JA.1.

**Table JA.1 Applicable nominal thickness and coating mass  
symbol (cold-reduced base metal is used)**

| Application   | Applicable nominal thickness<br>mm | Coating mass symbol <sup>a)</sup> |
|---|------------------------------------|-----------------------------------|
| For roofing   | 0.35 or over up to and incl. 1.0   | Z25, Z27                          |
|   | Over 1.0                           | Z27                               |
| For architectural siding  | 0.27 or over up to and incl. 0.50  | Z18, Z22, Z25, Z27                |
|   | Over 0.50 up to and incl. 1.0      | Z22, Z25, Z27                     |
|   | Over 1.0                           | Z27                               |
| Note <sup>a)</sup> Application of Z35, Z37, Z45 and Z60 may be agreed between the purchaser and the supplier. |                                    |                                   |

## Annex JB (normative)

### Nominal thickness, coating mass symbol and standard dimension for corrugated sheet

#### JB.1 Scope

This Annex specifies the nominal thickness, the coating mass symbol and the standard dimensions applicable to the corrugated sheet.

#### JB.2 Applicable nominal thickness and coating mass symbol

The nominal thickness and coating mass symbol applicable to corrugated sheets shall be as given in table JB.1.

**Table JB.1 Applicable nominal thickness and coating mass symbol (cold-reduced base metal is used)**

| Applicable nominal thickness<br>mm  | Coating mass symbol <sup>a)</sup> | Application<br>(informative)  |
|---|-----------------------------------|-------------------------------|
| 0.11 or over to and excl. 0.16  | Z12                               | Specific field of application |
| 0.16 or over to and excl. 0.27  |                                   | —                             |
| 0.27 or over up to and incl. 0.30   |                                   | Specific field of application |
| Over 0.30 up to and incl. 0.50  | Z18, Z22, Z25, Z27                | —                             |
| Over 0.50 up to and incl. 1.0   | Z18, Z22, Z25, Z27                |                               |
|   | Z22, Z25, Z27                     |                               |
| Note <sup>a)</sup> Application of Z35, Z37, Z45 and Z60 may be agreed between the purchaser and the supplier. |                                   |                               |

#### JB.3 Standard dimensions

##### JB.3.1 Standard nominal thickness

The standard nominal thickness of the corrugated sheet shall be as given in table JB.2. Values in parentheses shall be applied to the specific field of application for Z12.

**Table JB.2 Standard nominal thickness**

| Standard nominal thickness |        |        |        |        |      |      |      |      | Unit : mm |
|----------------------------|--------|--------|--------|--------|------|------|------|------|-----------|
| (0.11)                     | (0.12) | (0.13) | (0.14) | (0.15) | 0.16 | 0.17 | 0.19 | 0.20 |           |
| 0.25                       | 0.27   | 0.30   | 0.35   | 0.40   | 0.50 | 0.60 | 0.80 | 1.0  |           |

##### JB.3.2 Standard width and length of corrugated sheet before corrugation

The standard width and length of corrugated sheet before corrugation shall be as given in table JB.3.

**Table JB.3 Standard width and standard length**

Unit : mm

| Standard width before<br>corrugation | Standard length |       |       |       |       |       |       |
|--------------------------------------|-----------------|-------|-------|-------|-------|-------|-------|
| 762                                  | 1 829           | 2 134 | 2 438 | 2 743 | 3 048 | 3 353 | 3 658 |
| 914                                  | 1 829           | 2 134 | 2 438 | 2 743 | 3 048 | 3 353 | 3 658 |
| 1 000                                | 2 000           |       |       |       |       |       |       |

## **Annex JC (normative)**

### **Off-line test method for coating mass of hot-dipped zinc-coated steel sheet and strip using fluorescent X-ray method**

#### **JC.1 Scope**

This Annex specifies the test method for measuring the coating mass of the test piece taken from the hot-dipped zinc-coated steel sheets and strips, sheets before corrugation using fluorescent X-ray apparatus.

#### **JC.2 Measurement principle**

The coating mass is obtained by measuring the fluorescent X-ray strength from the coating emitted when the excited X-ray is irradiated to the specimen and comparing it to that from the specimen of known coating mass.

#### **JC.3 Apparatus**

The apparatus shall be as given in clause 5 of JIS K 0119.

#### **JC.4 Fluorescent X-rays to be measured**

The fluorescent X-ray to be measured shall be the primary ray of ZnK $\alpha$  (wave length 14.35 nm).

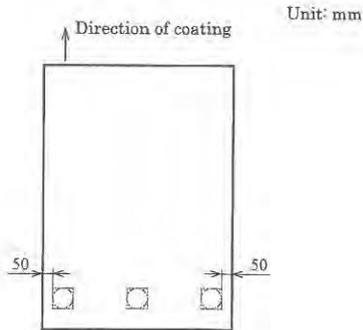
#### **JC.5 Test piece**

##### **JC.5.1 Size of test piece**

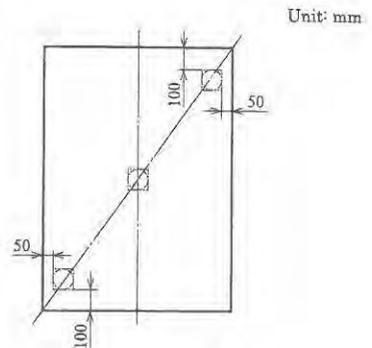
The test piece shall have such a size capable of being placed in a sample chamber of the fluorescent X-ray analyzer with the area of the primary X-ray irradiation to the test piece adjusted so as to be 314 mm<sup>2</sup> or more.

##### **JC.5.2 Sampling position and number of test pieces**

The test pieces shall be taken from the sample taken in accordance with 13.2.1. Each one shall be taken from three positions as shown in figure JC.1 or the position adjacent thereto in the case of a continuous zinc-coating method and each one shall be taken from three positions as shown in figure JC.2 or the position adjacent thereto in the case of a sheet-by-sheet zinc-coating method.



**Figure JC.1** Test piece sampling position (for continuous zinc-coating method)



**Figure JC.2** Test piece sampling position (for sheet-by-sheet zinc-coating method)

## JC.6 Preparation of working curve and calibration

### JC.6.1 Preparation of working curve

A working curve shall be prepared as follows. As an alternative method, however, the working curve may be prepared by obtaining the coating mass of the test piece for X-ray measurement used in c) in accordance with 5.2 of JIS H 0401 without purposely cutting out another test piece for X-ray measurement. In this case, cut out the test piece for X-ray measurement so that the area is 1 200 mm<sup>2</sup> or more.

- Cut out test pieces for X-ray measurement to prepare a working curve and those to determine the coating mass. Take each test piece from the steel sheets or strips of the same coating type as that of the measuring object. The size of test pieces for X-ray measurement shall be such as to fit in the sample chamber, and the number of the test pieces cut out shall be one or two adjacent to each other. Cut out two test pieces for X-ray measurement to determine the coating mass so as to have an area of 1 200 mm<sup>2</sup> or more from the both sides of the test piece for X-ray measurement.
- Decide which surface of the test piece for X-ray measurement to irradiate excited X-rays, and measure the coating mass of that surface of the test piece for X-ray measurement to determine the coating mass in accordance with 5.2 of JIS H 0401. In this case, in order to prevent the coating layer from elution, use measures such as applying lacquer to the opposite side of the measurement surface and drying, or mounting a broad tape. Obtain the coating mass of the surface of the test piece for X-ray measurement irradiated with excited X-rays by averaging the coating masses of two test pieces.
- Place the test piece for X-ray measurement in the apparatus and measure the strength of fluorescent X-rays emitted by irradiating excited X-rays under the condition set in JC.7 a).

- d) Using three or more test pieces for X-ray measurement various in coating mass, prepare the working curve based on the relationship between their strengths of fluorescent X-rays and coating masses.

#### JC.6.2 Calibration of working curve

Calibrate the working curve by placing test pieces for calibration various in coating mass in the apparatus and periodically <sup>1)</sup> measuring their strengths of fluorescent X-rays or converted values of coating mass.

Note <sup>1)</sup> Measurement every 8 h, or every day is preferable.

#### JC.7 Procedure

The procedure shall be as follows.

- a) Place the test piece of the minimum coating mass symbol among those to be measured in the apparatus, adjust the condition so that the relative standard deviation <sup>2)</sup> when measured consecutively ten times becomes 1 % or less and capable of reading the coating mass to the nearest 0.1 g/m<sup>2</sup>. When the X-ray strength is measured by count and the count number is 10 000 or over, however, duplicate measurements shall not be required.

Note <sup>2)</sup> The quotient obtained by dividing the standard deviation of measured values by the mean value (see **JIS K 0211**).

In the case of measuring a coating mass less than that of coating mass symbol used when the condition has been adjusted, confirm the above condition is satisfied using the test piece of relevant coating mass symbol. If the above condition is not fulfilled, readjust the condition.

- b) Mount the test piece in the sample chamber correctly.
- c) Irradiate the test piece with X-rays under the adjusted condition, and measure the fluorescent X-ray strength.
- d) Convert the fluorescent X-ray strength to the coating mass per 1 m<sup>2</sup> (one side, g/m<sup>2</sup>) using the working curve.
- e) Repeat procedures **b)** to **d)** also on the back surface of the test piece to obtain the coating mass, take the total of the coating masses of front surface and back surface as the coating mass of the test piece (both sides, g/m<sup>2</sup>).

#### JC.8 Check of apparatus

Check the apparatus properly. Checking items shall be in accordance with clause 15 of **JIS K 0119** and further check whether or not the measurement result by the apparatus is normal by comparing the coating mass measurement result with the measured value obtained in accordance with 5.2 of **JIS H 0401**.

## **Annex JD (normative)**

### **Online test method for coating mass of hot-dipped zinc-coated steel strip using fluorescent X-ray method**

#### **JD.1 Scope**

This Annex specifies the test method for measuring coating mass of hot-dipped zinc-coated steel strip using the fluorescent X-ray apparatus installed in a manufacturing line.

**Warning:** When measurement and maintenance of an apparatus are carried out based on this Annex, appropriate safety measures shall be taken. Especially, to avoid exposure to radioactive ray, strict controls shall be placed on safety.

**NOTE:** The law and regulation concerning installation and handling of the apparatus used in this Annex include Industrial Safety and Health Act, Ordinance on Prevention of Ionizing Radiation Hazards, etc.

#### **JD.2 Measurement principle**

The coating mass is obtained by measuring the fluorescent X-ray strength from the coating emitted when the excited X-ray (including  $\gamma$  ray) is irradiated to the coil and comparing it to that from the specimen of known coating mass.

#### **JD.3 Apparatus**

The apparatus consists of X-ray generation part, spectroscopy-detection-counting part and system controlling-data processing part as follows. Install the apparatus in the place free from temperature and humidity changes which could significantly affect measurement results.

##### **JD.3.1 X-ray generation part**

The X-ray generation part shall be such that it is capable of irradiating the position of the coil specified in **JD.6.3** with excited X-ray (including  $\gamma$  ray) directly.

##### **JD.3.2 Spectroscopy-detection-counting part**

The spectroscopy-detection-counting part shall be such that it is capable of measuring strength of fluorescent X-ray generated at the measuring position specified in **JD.6.3**.

##### **JD.3.3 System controlling-data processing part**

The system controlling-data processing part shall be such that it is capable of controlling the X-ray generation part and spectroscopy-detection-counting part to make possible measurement of the strength of fluorescent X-ray generated by irradiation the position specified in **JD.6.3** with excited X-ray (including  $\gamma$  ray) at and capable of recording the measurement results correspond to the irradiated position.

#### **JD.4 Fluorescent X-ray to be measured**

The fluorescent X-ray to be measured shall be a primary ray of  $ZnK\alpha$  (wave length 14.35 nm). For correcting the distance between the measurement surface and the apparatus, however, X-rays of other wave length may be measured simultaneously.

#### **JD.5 Preparation of working curve and calibration**

##### **JD.5.1 Preparation of working curve**

A working curve shall be prepared as follows. As an alternative method, however, the working curve may be prepared by obtaining the coating mass of the test piece used in c) for X-ray measurement in accordance with 5.2 of JIS H 0401 without purposely cutting out another test piece for X-ray measurement. In this case, the area of the test piece cut out for X-ray measurement shall be 1 200 mm<sup>2</sup> or more.

- a) Cut out test pieces for X-ray measurement to prepare a working curve and those to determine the coating mass. Take each test piece from the sheets or coils of the same coating type as that of the measuring object. The size of test pieces for X-ray measurement shall be such as to fit in the sample chamber, and the number of the test pieces cut out shall be one or two adjacent to each other. Cut out two test pieces for X-ray measurement to determine the coating mass so as to have a size of 1 200 mm<sup>2</sup> or more from the both sides of the test piece for X-ray measurement.
- b) Fix previously the surface of the test piece for excited X-ray (including  $\gamma$  ray) measurement to radiate excited X-rays, and measure the coating mass of that surface of the test piece for X-ray (including  $\gamma$  ray) measurement to determine the coating mass in accordance with 5.2 of JIS H 0401. In this case, in order to prevent solve out of coating layer, use measures such as to apply lacquer to the opposite side of the measurement surface and dry, or to mount a broad tape. Obtain the coating mass of the surface of the test piece for X-ray measurement irradiated with excited X-rays by averaging the coating masses of two test pieces.
- c) Place the test piece for X-ray measurement in the apparatus and measure the strength of fluorescent X-rays emitted by the irradiation of excited X-rays (including  $\gamma$  ray) under the conditions specified in JD.6.4 a).
- d) Using three or more test pieces for X-ray measurement with various coating masses, prepare the working curve based on the relationship between their strengths of fluorescent X-rays and coating masses.

##### **JD.5.2 Calibration of working curve**

Calibrate the working curve in accordance with JC.6.2.

## **JD.6 Measurement method**

### **JD.6.1 Measurement surface**

The surface of coil of which coating mass is to be measured shall be free from adherence of stain or metal powder which could affect significantly measurement results. The distance and inclination between the measurement surface and the apparatus shall be the same as those at the time when test pieces for X-ray measurement is measured. If any deviation of the distance and inclination between the measurement surface and the apparatus which can affect significantly measurement results occurs, correct the effect.

### **JD.6.2 Measuring mode**

The mode of measuring a coating mass shall be either one of the following.

One method is that for measuring by fixing the apparatus at the specified position of coil in width direction (hereafter referred to as “fixed point mode”) during irradiating X-ray to measure the coating mass of coil.

Another method is that for measuring by moving the apparatus at constant speed in the width direction of coil (hereafter referred to as “scan mode”). Which method to choose is decided by the manufacturer.

### **JD.6.3 Measuring position of coating mass**

The measuring position of coil in the width direction shall be as shown in figure JD.1 a) in the case of fixed point mode and as shown in figure JD.1 b) in the case of scan mode. In the case of the fixed point mode, measure the coating mass at each of three positions where the distance from both side edges (ends of the width direction) of the coil to the outside edge of X-ray beam becomes  $50^{+30}_0$  mm and the centre of the X-ray beam coincide with the centre of board width within  $\pm 15$  mm. In the case of the scan mode, move the apparatus at a constant speed in the direction of coil width, and measure the coating mass at each of three positions within the measuring ranges (A) shown in figure JD.1 b). In this case, the measuring ranges on the edge sides show the positions of the outside edge of X-ray beam and the centre of the board width shows the centre of the X-ray beam.

Measure the coating mass on both sides of a coil. The measuring position in the width direction of the front surface of a coil shall be the same as that of the back surface and the measuring position in the length direction of front surface shall be as near as possible to that of back surface.

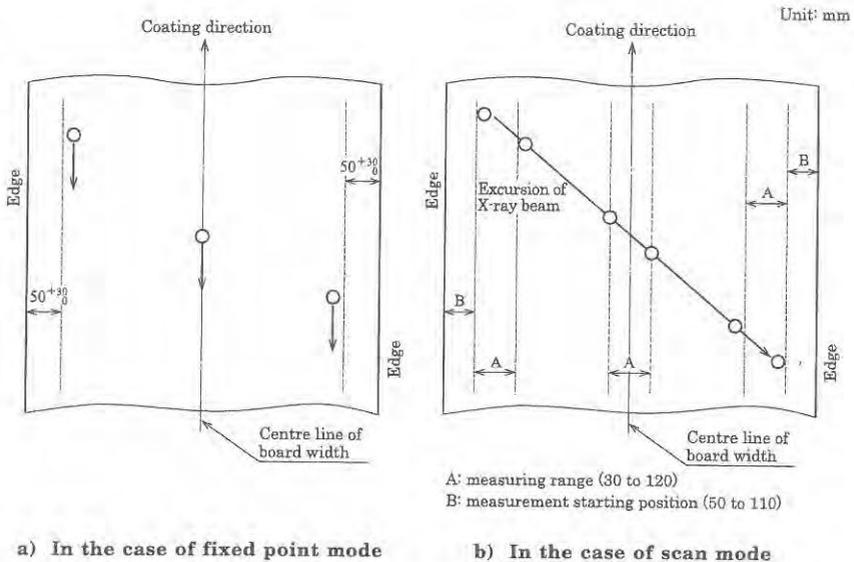


Figure JD.1 Measuring position of coating mass

#### JD.6.4 Measurement

The measurement shall be as follows;

- a) The measuring time of the one part shall be under four seconds. Place the test piece of the minimum coating mass symbol among those to be measured in the apparatus, adjust the condition so that the relative standard deviation <sup>1)</sup> when measured consecutively ten times on the product line setting the apparatus becomes 1 % or less and capable of reading the coating mass to the nearest 0.1 g/m<sup>2</sup>. When the X-ray strength is measured by count and the count number is 10 000 or over, however, duplicate measurements shall not be required.

Note <sup>1)</sup> The quotient obtained by dividing the standard deviation of measured values by the mean value (see JIS K 0211).

In the case of measuring a coating mass less than that of coating mass symbol used when the condition has been adjusted, confirm the above condition is satisfied using the test piece of relevant coating mass symbol. If the above condition is not fulfilled, readjust the condition.

- b) Irradiate the test piece with X-rays under the adjusted condition, and measure the fluorescent X-ray strength.
- c) Convert the fluorescent X-ray strength to the coating mass per 1 m<sup>2</sup> (one side, g/m<sup>2</sup>) using the working curve.

In addition, when the area of the coil is changed for skin-pass after coating mass measurement, it shall be corrected using change ratio of the area.

- d) Take the total of the coating masses of front surface and back surface as the coating mass of the one part of the test piece (both sides,  $\text{g/m}^2$ ).

#### **JD.6.5 Measured value of coating mass**

Obtain the average coating mass and the minimum coating mass using coating mass values at three positions in arbitrary one path <sup>2)</sup>. The path number, however, may be plural and the average coating mass and the minimum coating mass in the case of using plural paths are the average of all measured values and the minimum coating mass among all measured values, respectively.

Note <sup>2)</sup> One path means the measurement while moving the X-ray generation part from the coil edge at the arbitrary position in the coil to opposite side edge in one direction.

#### **JD.7 Check of apparatus**

Check the apparatus properly. Items to be checked shall be in accordance with clause 15 of **JIS K 0119** with the following.

- a) The temperature and humidity of the place where the apparatus is installed do not affect significantly measurement.
- b) The distance and inclination between the coil and the apparatus shall be constant at the time of measurement.
- c) The distance and inclination between the test piece and the apparatus at the time of calibration shall be the same as those at the time of measurement of the coil.
- d) The apparatus moves at constant speed in the case of scan mode.
- e) The apparatus measures the coating mass under the specified condition.
- f) The stain of the apparatus does not affect the measurement.
- g) The measurement results of coating mass with the apparatus according to this method are normal by comparing to results according to other measurement method [Annex JC or 5.2 of **JIS H 0401**].

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#### **Bibliography:**

JIS K 0211 *Technical terms for analytical chemistry (General part)*

**Annex JE (informative)**  
**Comparison table between JIS and corresponding International Standards**

| JIS G 3302 : 2010 <i>Hot-dip zinc-coated steel sheet and strip</i> |   | (III) Requirements in International Standard |          | (IV) Classification and details of technical deviation between JIS and International Standard by clause             |                          | (V) Justification for the technical deviation and future measures                        |
|--|---|--|----------|---|--------------------------|--|
| (I) Requirements in JIS  |   | (II) International Standard number           | Clause   | Content   | Classification by clause |  |
| 1 Scope<br>No. and title of clause                                 | The hot-dip zinc-coated steel sheet and strip are specified.  | ISO 3575                                     | 1.1      | The hot-dip zinc-coated steel sheet of commercial and drawing qualities, and steel coil are specified.              | Addition                 | In JIS, scope covers the contents of two ISO Standards. And corrugated sheets are added. |
|  |   | ISO 4998                                     | 1        | The hot-dip zinc-coated steel sheet and coil of structural quality are specified.                                   |                          |  |
| 2 Normative references   |   |  |          |   |                          |  |
| 3 Grade, symbol and applicable nominal thickness                   | Grade symbols and nominal thickness of 3 grades for commercial use, 4 grades for drawing use, those for high intensity commercial use and 10 grades for structural use are specified. | ISO 3575                                     | 1<br>4.2 | Grade symbols and nominal thickness of 1 grade of commercial quality and 4 grades of drawing quality are specified. | Alteration               | Based on the difference in market demands.   |
|  |   | ISO 4998                                     | 1<br>4.2 | Grade symbols and nominal thickness of 7 grades of structural quality are specified.                                |                          |  |

| (I) Requirements in JIS      |  | (II) International Standard number | (III) Requirements in International Standard |   | (IV) Classification and details of technical deviation between JIS and International Standard by clause |   | (V) Justification for the technical deviation and future measures   |
|------------------------------|--|------------------------------------|--|---|---|---|---|
| No. and title of clause      | Content  |                                    | Clause                                       | Content   | Classification by clause  | Details of technical deviation  |   |
| 4 Chemical composition       | The chemical composition (four elements) of base metal to which coating is applied is specified.   | ISO 3575<br>ISO 4998               | 4.1  | The chemical composition (four elements) of base metal, upper limit of alloy element not specified and permissible variation in product analysis are specified. | Alteration  | The chemical composition differs between JIS and ISO Standards. In JIS, the upper limit of alloy element not specified and permissible variation in product analysis are not specified. | Since the specified mechanical properties differ between JIS and ISO Standards, chemical composition differs. In JIS, product analysis is not specified because of no market demands. |
| 5.1 Type of coating          |  |                                    | 1.6<br>1                                     |   | Identical   |   |   |
| 5.2 Coating mass             | Coating mass symbol, and minimum average coating mass at triple spots and minimum coating mass at single spot as coating mass are specified. |                                    | 4.3.1<br>5.3                                 |   | Alteration  | In JIS, the more detailed coating mass than that in ISO Standards is specified.   | The market demands for coating mass differs.  |
| 5.3 Coating surface finishes |  |                                    | 7.3  |   | Identical   |   |   |
| 5.4 Coating adherence        | Coating adherence of non-alloyed coating is specified.   |                                    | 4.3.2<br>5.4                                 | The evaluation of coating adherence by bend test is specified.  | Addition  | Although the evaluation by bend test does not differ between JIS and ISO Standards, in JIS, other evaluation tests are added.   | In JIS, the evaluation by the more accurate test method is approved upon the agreement between the purchaser and the supplier.  |
| 6 Chemical treatment         | Five types of chemical treatment are specified.  |                                    | 4.6.1<br>4.6.2                               | Two types of chemical treatment are specified.  | Addition  | In JIS, the chemical treatment capable of supporting environmentally restricted substances is added.  | The proposal of addition of chemical treatment symbols to ISO Standards will be submitted.  |
| 7 Oiling                     |  |                                    | 4.6.3  |   | Identical   |   |   |

| (I) Requirements in JIS      |  | (II) International Standard number | (III) Requirements in International Standard  |                          | (IV) Classification and details of technical deviation between JIS and International Standard by clause |   | (V) Justification for the technical deviation and future measures  |
|------------------------------|--|------------------------------------|---|--------------------------|---|---|--|
| No. and title of clause      | Content  | Clause                             | Content   | Classification by clause | Details of technical deviation  |   |  |
| 8 Mechanical properties      | Bendability and tensile test characteristics (yield point or proof stress, tensile strength, and elongation) as mechanical properties are specified. | 4.2                                | Tensile test characteristics (yield point or proof stress, tensile strength, and elongation) are specified. | Addition                 | In JIS, bendability is added.   | The bend test in JIS can be omitted, and the deletion of bendability will be studied in the future. |  |
| 9.1 Expression of dimensions |  | 1 Annex A                          | For thickness, either product thickness or base metal thickness is used.                                    | Deletion                 | For thickness in JIS, base metal thickness is used.   | The tensile test characteristics are based on the difference in market demands.                     | In JIS, from the viewpoint of commercial practice, base metal thickness is used. Although in ISO Standards only product thickness was specified, the proposal of addition of use of base metal thickness was submitted and adopted in ISO Standards published in 2005. |
| 9.2 Standard dimensions      | Standard dimensions are specified.   |                                    |   | Addition                 | In JIS, standard dimensions are added.  |   | In JIS, from the viewpoint of commercial practice, it is necessary to specify standard dimensions.   |
| 9.3 Dimensional tolerances   | Dimensional tolerances are specified.  | 4.8 Annex A                        |   | Alteration               | Dimensional tolerances differ between JIS and ISO Standards.  |   | Dimensional tolerances are specified based on the tolerances on hot-rolled steel sheet and cold-reduced base metal.  |

| (I) Requirements in JIS        |  | (II) International Standard number | (III) Requirements in International Standard |            | (IV) Classification by clause   | (V) Classification and details of technical deviation between JIS and International Standard by clause   | (V) Justification for the technical deviation and future measures |
|--------------------------------|--|------------------------------------|--|------------|---|--|---|
| No. and title of clause        | Content  |                                    | Clause                                       | Content    |   |  |   |
| 10 Shapes                      | Shapes are specified.  | ISO 3575<br>ISO 4998               | 4.8  | Alteration | Tolerances on shapes differ between JIS and ISO Standards.                  | Tolerances on shapes are specified based on tolerances on hot-rolled steel sheet and cold-reduced steel sheet.<br>The proposal of revision of tolerances on flatness in ISO Standards was submitted, and is under review as of 2009. |   |
| 11 Mass and tolerances thereof | Mass of sheets and coils is specified.                                       |                                    | —  | Addition   | In JIS, the measured mass or the calculated mass is used.                   | In JIS, from the view-point of commercial practice, it is necessary to specify mass.   |   |
| 12 Appearance                  |  |                                    | 9  | Identical  |   |  |   |
| 13.1 Analysis test             | Sampling method and analytical method are specified.                         |                                    | 4.1<br>5.1                                   | Addition   | In JIS, the sampling method and analytical method are concretely specified. | Since the standard system differs between JIS and ISO Standards, it is necessary to specify concretely.  |   |
| 13.2 Coating test.             | Coating mass test, adhesion test and corrosion-resistant test are specified. |                                    | 5.3<br>5.4<br>6.2.1<br>6.2.2                 | Addition   | In JIS, the corrosion resistance test of coating is added.                  | Added in JIS since the data on corrosion resistance may be requested by the purchaser.   |   |

| (I) Requirements in JIS                       |  | (II) International Standard number | (III) Requirements in International Standard |         | (IV) Classification and details of technical deviation between JIS and International Standard by clause |  | (V) Justification for the technical deviation and future measures   |
|---|--|------------------------------------|--|---------|---|--|---|
| No. and title of clause                       | Content  |                                    | Clause                                       | Content | Classification by clause  | Details of technical deviation   |   |
| 13.3 Mechanical test                          | Test pieces and test methods in the bend test and tensile test are specified.                                    | ISO 3575<br>ISO 4998               | 4.2<br>5.2<br>6.1<br>6.2.2                   | —       | Alteration  | The shape of tensile test piece differs between JIS and ISO Standards.   | In JIS, the original shape of tensile test piece of JIS is used.  |
| 14.1 Inspection                               | Inspection is specified.   |                                    | —  | —       | Addition  | In JIS, inspection is specified by arranging it into one clause, and in ISO Standards it is specified by using separate clauses. | The standard system differs between JIS and ISO Standards.  |
| 14.2 Re-inspection                            |  |                                    | 5.5  | —       | Identical   |  |   |
| 15 Marking                                    | Items to be marked are specified.  |                                    | 7<br>1.1                                     | —       | Addition  | In JIS, the markings for roofing, architectural siding and corrugated sheets are added.  | In JIS, symbols for roofing, architectural siding and corrugated sheet are added.                           |
| 16 Items to be confirmed at the time of order |  |                                    | 12   | —       | Addition  | In JIS, dimensions of corrugated sheets are added.   |   |
| 17 Report                                     | Report is specified.   |                                    | —  | —       | Addition  | In JIS, report is added.   | In JIS, since from the viewpoint of commercial practice report may be required, it is necessary to specify. |
| Annex JA (normative)                          | Nominal thickness and coating mass symbol for sheet and coil for roofing and architectural siding are specified. |                                    | —  | —       | Addition  | In JIS, the specification for roofing and architectural siding is added.   | It is necessary to specify for the specific application.  |

| (I) Requirements in JIS |   | (II) International Standard number | (III) Requirements in International Standard |  | (IV) Classification and details of technical deviation between JIS and International Standard by clause |  | (V) Justification for the technical deviation and future measures  |
|-------------------------|---|------------------------------------|--|--|---|--|--|
| No. and title of clause | Content   |                                    | Clause                                       | Content  | Classification by clause  | Details of technical deviation   |  |
| Annex JB (normative)    | Nominal thickness, coating mass symbol and standard dimension for corrugated sheet are specified.         | ISO 3575<br>ISO 4998               | —  | —  | Addition  | In JIS, the specification of corrugated sheets is added.   | The corrugated sheets are the product originally specified in JIS, and therefore it is necessary to specify. |
| Annex JC (normative)    | The specification of the off-line test method for the coating mass using fluorescent X-rays is specified. |                                    | —  | —  | Addition  | Although the test method for the coating mass is specified in JIS, not specified in ISO Standards. | In JIS, it is necessary to specify of the coating mass test method.  |
| Annex JD (normative)    | The specification of the online test method for the coating mass using fluorescent X-rays is specified.   |                                    | —  | —  | Addition  | Although the test method for the coating mass is specified in JIS, not specified in ISO Standards. | In JIS, it is necessary to specify of the coating mass test method.  |
| —                       | —   |                                    | 3  | Terms and definitions are specified.   | Deletion  | Deleted in JIS.  | In JIS G 0203, terms are defined.  |
| —                       | —   |                                    | 8  | The resubmission for acceptance when the products have been rejected during earlier inspection is specified. | Deletion  | Deleted in JIS.  | Specified in the normative reference of JIS G 0404.  |
| —                       | —   |                                    | 10   | Attendance inspection is specified.  | Deletion  | Deleted in JIS.  | Specified in the normative reference of JIS G 0404.  |

Overall degree of correspondence between **JIS** and International Standards (ISO 3575 : 2005, ISO 4988 : 2006) : MOD

NOTE 1 Symbols in sub-columns of classification by clause in the above table indicate as follows :

- Identical : Identical in technical contents.
- Deletion : Deletes the specification item(s) or content(s) of in International Standards.
- Addition : Adds the specification item(s) and content(s) which are not included in International Standards.
- Alteration : Alters the specification content(s) which are included in International Standards.

NOTE 2 Symbol in column of overall degree of correspondence between **JIS** and International Standards in the above table indicates as follows :

- MOD : Modifies International Standards.

# Exhibit 5

**DOCUMENT(S) NOT SUSCEPTIBLE  
OF SUMMARY**

# Exhibit 6

| Name | Address | Contact Information | Level of Trade |
|------|---------|---------------------|----------------|
| [    |         |                     | ]              |
| [    |         |                     | ]              |
| [    |         |                     | ]              |
| [    |         |                     | ]              |
| [    |         |                     | ]              |
| [    |         |                     | ]              |

# Exhibit 7

**DOCUMENT(S) NOT SUSCEPTIBLE  
OF SUMMARY**

# Exhibit 8

**DOCUMENT(S) NOT SUSCEPTIBLE  
OF SUMMARY**

# Exhibit 9

**DOCUMENT(S) NOT SUSCEPTIBLE  
OF SUMMARY**

# Exhibit 10

**DOCUMENT(S) NOT SUSCEPTIBLE  
OF SUMMARY**

# Exhibit 11

**DOCUMENT(S) NOT SUSCEPTIBLE  
OF SUMMARY**

# Exhibit 12

**DOCUMENT(S) NOT SUSCEPTIBLE  
OF SUMMARY**

# Exhibit 13

## 2013年材質附價說明書

主旨：含硼材質附價說明書

製品範圍：熱浸鍍(鋁)鋅產品適用

| SPEC       | PROD.      | 材質附價       |     |            |
|------------|------------|------------|-----|------------|
| [Redacted] | HRB        | [Redacted] |     |            |
|            | HRC        |            |     |            |
|            | HRB        |            |     |            |
|            | HRC        |            |     |            |
|            | HRB        |            |     |            |
|            | HRC        |            |     |            |
|            | HRB        |            |     |            |
|            | HRC        |            |     |            |
|            | HRB        |            |     |            |
|            | HRC        |            |     |            |
|            | HRB        |            |     |            |
|            | HRC        |            |     |            |
|            | HRB        |            |     |            |
|            | HRC        |            |     |            |
|            | [Redacted] |            | HRB | [Redacted] |
|            | [Redacted] |            | HRC | [Redacted] |

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## 2010年材質附價說明書

主旨：含硼材質附價說明書

製品範圍：熱浸鍍(鋁)鋅產品適用

| SPEC | PROD. | 材質附價 |
|------|-------|------|
|      | HRB   |      |
|      | HRC   |      |
|      | HRB   |      |
|      | HRC   |      |

-以下空白-





## 2002年材質附價說明書

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主旨：含硼材質附價說明書

製品範圍：熱浸鍍(鋁)鋅產品適用

| SPEC       | PROD. | 材質附價       |
|------------|-------|------------|
| [REDACTED] | HRB   | [REDACTED] |
|            | HRC   |            |

- 以下空白 -

