CIDB MALAYSIA

TECHNICAL OPINION

SUBMITTED TO CIDB MALAYSIA | OCTOBER 2011

TECHNICAL OPINION REPORT

PRODUCT
WIRA ECO BUILDING SYSTEM (WEBS)

APPLICANT
WIRA KERJAYA SDN. BHD.

CIDB MALAYSIA

CONSTRUCTION INDUSTRY DEVELOPMENT BOARD
7th Floor, CIDB Headquarters,
Grand Seasons Avenue,
No. 72, Jalan Pahang, 53000 Kuala Lumpur

CREAM
Construction Research Institute of Malaysia

CONSTRUCTION RESEARCH INSTITUTE OF MALAYSIA
Makmal Kerja Raya Maysia (MKRM),
IBS Centre, 1st Floor, Block E, Lot 8,
Jalan Chan Sow Lin, 55200 Kuala Lumpur

FOREWORD

Construction Industry Development Board (CIDB Malaysia) is a statutory body enacted under the Act 520 in 1994. Its mission is to develop Malaysian Construction Industry towards global competitiveness. To support that mission, a number of functions were formulated and one of them is to encourage the improvement of construction techniques and materials. Under that function, CIDB is to carry out assessment and appraisal of innovations of any kind of product and technology related to construction and to publish its finding, in the form of Technical Opinion.

This Technical Opinion will provide a reference to the relevant/interested parties in the construction industry. CIDB assess innovation based on application and evaluation by its Technical Opinion. Applicants may use it as a supporting document for regulatory and approving authorities, architects, engineers and others in dealing with the new products and technologies.

This Technical Opinion was prepared on behalf of CIDB by The Technical Expert Panels on construction products, construction material and technology in Construction Industry. The Technical Expert Panels was set-up by CREAM and its members were drawn from experts that represent relevant sector in the construction industry.

This Technical Opinion has been modelled based on international recommended practice.

CIDB Technical Expert Panel Committee for Lightweight Steel Structure

Technical Expert Panel

Ir. Dr Zuhairi Abd. Hamid	(Chairman)	Construction Research Institute of Malaysia (CREAM)
Prof. Ir. Dr. Abdul Karim Mirasa	(Technical Expert Panel)	Universiti Teknologi Malaysia (UTM)
Prof. Ir. Dr. Wan Hamidon Wan Badaruzzaman	(Technical Expert Panel)	Universiti Kebangsaan Malaysia (UKM)
Dr. Samsul Bahar Sadli	(Technical Expert Panel)	Det Norske Veritas As Sdn. Bhd.

Secretariat

Ahmad Hazim Abdul Rahim	CREAM
Muhammed Asraff Abdul Rahman	CREAM
Rohani Mokhtar	CREAM
Wan Norhasiah Wan Bidin	CREAM

GENERAL PROVISIONS

The purposes of this report is to assist respective parties concerned both applicant and granting approval authority, includes specification and also use of the subject. This report shall not be considered as approval.

Special note should be taken of the provisions and limitations set out and the period of validity of the Technical Opinion.

Technical Opinion is initially given a term of validity of three years from the date of issue in the expectation that, after that period, the subject will no longer be an innovation. They can be reviewed within the first twelve months and again as necessary during the life of the products or system described in the document. The limitation on the validity of the opinions should not be interpreted as implying a similarly limited life expectancy of the products or system described in the Technical Opinion. However, if experience shows poor overall standard of quality or performance, the Technical Opinion will be withdrawn.

The legitimacy and validity of the Technical Opinion can be verified at office of CIDB Head Office.

CIDB, the Technical Expert Panels shall accept no responsibility for the quality and performance of the products.

Disclaimer

While every effort is made to ensure accuracy of the information presented in this report, neither the Technical Expert Panels nor its Secretariats or CIDB can accept responsibility for any loss or damage incurred in connection with the use of the contents.

Definition

Technical Opinion Programme	: A programme initiated by CIDB with the aim to evaluate products, materials, components or system with regard to, but not limited to IBS. It normally covers wide range of innovative products to be used in local construction industry
Technical Expert Panel	: Individual selected based on their expertise in lightweight steel structure.
Lightweight steel structure	: A light gauge steel-framing member, made from structural quality sheet steel that is usually formed by cold rolling through dies.
Cold form	: Products made by rolling or pressing thin gauges of sheet steel into goods.

Abbreviation

3D	Three Dimensions
ASTM	American Society for Testing and Materials
BS EN ISO	British, European and an International Standard
BS EN	European Standard adopted as a British Standard
BS	British Standard
CIDB	Construction Industrial Development Board
CREAM	Construction Research Institute of Malaysia
EN	European Standard
GB/T	Chinese Standard
ISO	International Standards Organisation
MOD ISO	Modification of ISO
MS	Malaysian Standard
PKFZ	Port Klang Free Zone
QA/QC	Quality Assurance / Quality Control
RHS	Rectangular Hollow Section
SHS	Square Hollow Section
SLS	Serviceability Limit State
ULS	Ultimate Limit State
WEBS	Wira Eco Building System
WJX (LZ)	Chinese Standard
WKSB	Wira Kerjaya Sdn Bhd

Symbols

%	percent
cm	centimeter
g	gram
K	kelvin
kg	kilogram
kN	kilo newton
m	meter
Mb	buckling resistance moment
mm	millimeter
Mpa	megapascal
N	newton
W	watt
λ	slenderness ratio
ρ_c	compressive strength

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1.0 IDENTIFICATION

1.1 Title of Product

WEBS (WIRA Eco Building System) - Lightweight steel structure for building

1.2 Dates of Evaluation

3rd November 2010, 27th January 2011, 7th June 2011

1.3 Purpose

For use as a structural frame and finish product in building construction.

1.4 Applicant & Address

Wira Kerjaya Sdn Bhd
19 E, 5th Floor, Worldwide Business Park.
Block 2, Jalan Tinju 13/50,
Section 13, 40675 Shah Alam,
Selangor Darul Ehsan
Contact :
Telephone : 03-5511 1007
Website : www.wirakerjaya.com.my

2.0 DESCRIPTION

2.1 General Description of Product

Lightweight steel structure is a framing member made from quality structural steel sheet and applied with a layer of zinc coating. This system is used to construct a building. The product is made of lightweight steel structure and infill with lightweight concrete.

(Note: All materials mentioned in this technical report are imported from China.)

2.2 Element of Product

i. Galvanised steel sheet
   a) S 350GD+Z - (EN10142:2000)
   b) Yield stress : 350 N/mm^2

   (Note: SZ correspond to raw material steel grade: Hot dip galvanising products)

ii. Connector
   a) Self tapping screw : ST4.2, ST4.8, ST5.5

      (Note: The self tapping screws are shown in Appendix D)
   b) Standard connector :

- I shape connector (for small truss in rigid frame)
- Z and C connector (for connection upper and lower level frame inside the wall)

iii. Type of concrete and application

Concrete is poured inside the wall and on top of floor beam. The compression strength of the concrete in the wall or slab are separately identify as LC 5 (5 N/mm^2 for wall) or LC 15 (15 N/mm^2 for slab)

2.3 Usage Limitation

This product is used in construction industry as framing member for the buildings like residential houses, buildings (up to six stories), workshops, factories and etc. It also used as roof trusses.

2.4 Manufacturing process

The method of manufacturing for chord hollow section (RHS and SHS) is formed and shaped at ambient temperature from single strip steel, both edge of which are continuously welded by the electric resistance. Whilst for the connector, is through a die cast stamping process. Detail of the manufacturing process is shown in Appendix B.

2.5 Technology / Skill required

The lightweight steel structure is originated from China and has been used for three (3) years at Sichuan province earthquake area in Beijing. This product is available and has been used in Malaysia since the last five (5) months at Port Klang Free Zone (PKFZ). The technology from China has been transferred to Wira Kerjaya Sdn Bhd (WKSB). The product can be installed by WEBS installer team. It is simple to install by an ordinary worker after one day of training.

(Note: The Technical Expert Panels proposed that earthquake performance test on the building done at any CIDB Approved Lab.)

3.0 BASIS OF APPRAISAL

3.1 Check on Document Received from Wira Kerjaya Sdn. Bhd.

The following documents were received in copied to confirm appraisal of the products.

i. Test report on the material and testing
ii. Design calculation for column stud

3.2 Technical Visit to Factory at Port Klang Free Zone, (PKFZ)

Site visit was on 27th January 2011. The purpose of the visit was to determine the actual condition of the factory building. The site visit photos are attached in Appendix A

4.0 MATERIAL: STANDARDS, SPECIFICATIONS AND TESTS

4.1 Material Standards and Specifications

i. Table of properties, size & dimension

The table of properties, size and dimension are attached in Appendix C

ii. Strength

a) The compression strength of the concrete in the wall or slab are separately identify as LC 5 or LC 15.

b) The yield stress of the cold-rolled or hot-rolled forming galvanised steel plate is 235 N/mm^2, 280 N/mm^2, 320 N/mm^2, 350 N/mm^2 or more high strength steel

iii. Performance

The performance of the structure material are shown in Appendix F

(Note: All tests and reports provided by WKSB were performed in accordance with Chinese Standard. Other equivalent or resemblance section standard i.e. BS EN 10219-2:2006 is included in this report for reference.)

4.2 Type of Tests

i. Energy Saving Wall Test (Lightweight Steel Structure)
ii. Galvanized Steel Sheet (Lightweight Steel Structure Raw Material)
iii. Screw Test – Cross Recessed Pan Head (Connection)
iv. Screw Test – Hexagon Flange Head (Connection)
v. Corrosion, Fire, Sound Test

4.3 Additional Tests Required

The supplier is to notify to the Technical Expert Panel Committee on any additional test required (if any) by fabricator or client during the validation period.

4.4 Check on Test Reports Provided by WKSB

i. Energy Saving Wall Test

Type of tests	Result	Chinese Standard *Note : All tests are done at National Centre for Quality Supervision and Test of Building Engineering)*
Wall Body Thermal Resistance	R = 1.65m^2.K/W	GB/T13475-2008
Heat Transfer Coefficient	K = 0.56W/(m^2.K)	GB/T13475-2008
Thermal Insulation of Fire Resistance	Thermal insulation of fire – resistant ≥181 minute	GB/T 9978.1-2008 (Article 10.2.3)
Fire Resistance test	Intergrality Fire-Existing ≥ 181 mm	GB/T 9978.1-2008 (Article 10.2.3)

ii. Raw Material – Galvanized Steel Sheet Test

a) 22 t (*t representative quantity*)

Type of tests	Result	Chinese Standard *Note : All tests are done at National Centre for Quality Supervision and Test of Building Engineering)*	Comment From Accredited Lab in China *Note : All tests are done at National Centre for Quality Supervision and Test of Building Engineering)*
Tensile Strength	580 MPa	WJX (LZ)45-2004	According to WJX (LZ)45-2004, this tested items meet the criterion of heat-galvanized steel sheet as 350+Z
Yield Strength	485 MPa		
Bend Test	Qualified		
Elongation	17%		
Mass of Galvanizing	197 g/m^2		

b) 50 t

Type of tests	Result	Chinese Standard *Note : All tests are done at National Centre for Quality Supervision and Test of Building Engineering)*	Comment From Accredited Lab in China *Note : All tests are done at National Centre for Quality Supervision and Test of Building Engineering)*
Tensile Strength	425 MPa	WJX (LZ)45-2004	According to WJX (LZ)45-2004, this tested items meet the criterion of heat-galvanized steel sheet as 350+Z
Yield Strength	370 MPa		
Bend Test	Qualified		
Elongation	21%		
Mass of Galvanizing	207 g/m^2		

iii. Connection-Screw Test-Crossed Pan Head

Type of tests	Result	Chinese Standard *Note : All tests are done at National Centre for Quality Supervision and Test of Building Engineering)*
Shear failure force	5.087 kN (mean)	• GB/T 3098.11-2002
Failure moment of torsion	4.88 Nm (mean)	
Mass	1.6480 g (mean)	
Mass of galvanizing	0.0128 g (mean)	• GB/T 2973-2004

iv. Connection-Screw Test-Hexagon Flanged Head

a) 7000 (*representative quantity*)

Type of tests	Result	Chinese Standard *Note : All tests are done at National Centre for Quality Supervision and Test of Building Engineering)*
Shear failure force	8.496 kN (mean)	• GB/T 3098.11-2002
Failure moment of torsion	7.60 Nm (mean)	
Mass	-	
Mass of galvanizing	-	

b) 8000

Type of tests	Result	Chinese Standard *Note : All tests are done at National Centre for Quality Supervision and Test of Building Engineering)*
Shear failure force	6.986 kN (mean)	• GB/T 3098.11-2002
Failure moment of torsion	5.52 Nm (mean)	
Mass	3.0381 g (mean)	
Mass of galvanizing	0.0144 g (mean)	• GB/T 2973-2004

5.0 DESIGN

5.1 Design Analysis of Double Storey Bungalow at PKFZ

The checking of analysis was performed by using STAAD Pro Analysis Software and then the design was done manually. The structural component was designed based on the recommendation of BS 5950: Part 1: 2000. Based on design calculation given, the column stud was designed for short column. The section is satisfactory for buckling check. The detail calculation is based on single size only which is 40 x 40 x 2 mm and attached in Appendix D. For further detail on other design calculation, please refer to WKSB. The recommendation given for this technical report is based on the design given by WKSB.

6.0 COMPLIANCE TO OTHER EQUIVALENT AND RESEMBLANCE STANDARDS

6.1 Lightweight Steel Structure Tests

A series of checks to types of test performed by WKSB shows that only a few equivalent and resemblance standards has been found.

Type of Tests	**Chinese Standard** *(Reference provided by WKSB)*	**Other Equivalent and Resemblance Standards**[2,3] *(See Note 2 and 3)*
Energy Saving Wall Test		
- Wall Body Thermal Resistance - Heat Transfer Coefficient	GB/T 13475-2008 Steady-State Heat Insulation Properties Calibrated and Guarded Hot Box Method	ISO 8990 : 1994 Thermal insulation: Determination of Steady-State Thermal Transmission Properties. Calibrated and Guarded Hot Box BS EN ISO 8990:1996 Thermal Insulation: Determination of Steady-State Thermal Transmission Properties. Calibrated and Guarded Hot Box MS 1532:2002 Thermal Insulation: Determination of Steady-State Thermal Transmission Properties. Calibrated and Guarded Hot Box
- Thermal Insulation of Fire Resistance	GB/T 9978.1-2008 Test Methods for Fire Resistance of Building Elements Part 1 : General Requirements / Building Components Resistance Test Method GB/T 9978.8-2008 Resistance Test Methods of Building Elements Part 8: Non-Load-Bearing Special Requirements of Vertical separating Elements	MOD ISO 834-1:1999 Fire Resistance Test Elements of Building Construction-Part 1: General Requirements MS 1073:Part 2:1996 Method for Determination of the Fire Resistance – General Principles MOD ISO 834-8:2002 Fire Resistance Test Elements of Building Construction-Part 8: Specific Requirements
Fire Resistance Test	GB/T 9978.1-2008 Test Methods for Fire Resistance of Building Elements Part 1 : General Requirements / Building Components Resistance Test Method	MOD ISO 834-1:1999 Fire Resistance Test Elements of Building Construction-Part 1: General Requirements

Raw Material - Galvanised Steel Sheet Test	WJX (LZ)45-2004	ASTM A653/A653M-09a Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy- Coated (Galvannealed) by Hot Dip Process / Coating Specification MS 606:1979/1991 Specification for Hot Dip Zinc Coated Steel Sheet and Coil
Connection - Screw Test : Crossed Pan Head	GB/T 3098.11-2002 Mechanical Properties of Fastener Drilling Tapping Screws	ISO 10666:1999 Mechanical Properties of Fasteners-Drilling Screws with Tapping Screw Thread BS EN ISO 10666:1999 Drilling Screws with Tapping Screw Threads. Mechanical and Functional Properties
	GB/T 2973-2004 Quality Galvanized Steel Zinc Coating Test Methods	ISO 1460:1992 Zinc Coated Steel Wire Test Method for Gravimetric Determination of Zinc Coating MS 1196:2004 Continuous Hot-dip Aluminium/ Zinc-coated Steel Sheet of commercial, Drawing and Structural Qualities
- Screw Test : Hexagon Flanged Head	GB/T 3098.11-2002 Mechanical Properties of Fastener Drilling Tapping Screws	ISO 10666:1999 Mechanical Properties of Fasteners-Drilling Screws with Tapping Screw Thread BS EN ISO 10666:1999 Drilling Screws with Tapping Screw Threads. Mechanical and Functional Properties
RHS and SHS	The testing document on the product is not provided by WKSB. Therefore, the Technical Expert Panels recommended this product to be tested at any lab approved by CIDB.	

Note 1 : If not mentioned in the table, no equivalent Malaysian Standard observed. Detail on translated test report on material are shown in Appendix F.

[2]Note 2 : The equivalent and resemblance standards are based from internet search by the Secretariat.

[3]Note 3 : The Technical Expert Panels cannot established acceptable range specify in other equivalent and resemblance standards as this was not part of the terms of reference required

6.2 Structural Design and Aspect of Material

The structural design codes used by WKSB are listed below:

Standard	Description
BS 5950 – Part 1 : 2000 Structural Use of Steelwork in Building	Code of Practice for Design – Rolled and Welded Sections
BS 5950 – Part 5 : 1998 Structural Use of Steelwork in Building	Code of Practice for Design of Cold Formed Thin Gauge Section
BS EN 10219 – Part 1 : 2006 Cold Formed Welded Structural Hollow Sections of Non-alloy and Fine Grain Steels	Technical Delivery Conditions
BS EN 10219 – Part 2 : 2006 Cold Formed Welded Structural Hollow Sections of Non-alloy and Fine Grain Steels	Tolerances, Dimensions and Sectional Properties

7.0 VALIDITY OF OPINION

7.1 Condition

The Technical Opinion given here was based on the Chinese Standard (GB/T13475-2008, GB/T9978.1-2008, *WJX (LZ) 45-2004, GB/T3098.11-2002&GB/T2973-2004*). The recommendations by Technical Opinion Expert Panels are also based and limited to available information provided by applicant.

All results and test report were issued from Accredited Lab in China.

The assessment is only focusing on the performance and quality of raw material but not on the structural performance of the product. The Technical Expert Panels proposed that structural performance test on the structural members to be done at any CIDB Approved Lab.

7.2 Withdrawal

In the event of non compliance to the Chinese Standard or any other equivalent and resemblance standards will lead to withdrawal of this opinion.

7.3 Term of Validity

The recommendation is valid for three (3) years from the date of issuance of this Technical Opinion Report.

8.0 RELEVANT DOCUMENTS

8.1 Standard

Technical Opinion Expert Panels had faced some problems due to limited references and equivalent standard in Malaysia. However, the Secretariat has cross referred with other equivalent and resemblance standards as mentioned above.

8. 2 QA/QC Plan Document

QA/QC plan document for the purpose of manufacturing and construction are not provided in this report. This document is important to ensure quality in production is observed at all time during process of making the components. The Technical Expert Panels proposed that an official QA/QC Plan to be provided for future reference.

9.0 APPROVED OPINION ABSTRACT

Lightweight steel structure manufactured by WKSB at their plant in PKFZ, Selangor was found to meet the Specification of Chinese Standard. Further examination has indicated that the design used is in accordance to BS 5950 and BS EN 10219. For the material used only Chinese Standard are referred to. Most of the Standards used for material are checked against Chinese Standard i.e. WJX (LZ) 45-2004. This standard is equivalent and resemble with ASTM A653/A653M and MS 606:1979/1991. The lightweight steel structures have been tested at National Centre for Quality Supervision and Test of Building Engineering and met the requirement for use as frame system in buildings. For load bearing wall, no testing records have been provided as such the Technical Expert Panels recommended this load bearing wall to be tested at any lab approved by CIDB. The standards used for tests on the wall are GB/T 13475-2008, GB/T 9978.1-2008, GB/T 9978.8-2008, GB/T 3098.11-2002 and GB/T 2973-2004. Other equivalent and resemblance standards recommended to be referred to are BS EN ISO 8990:1996, MOD ISO 834-1:1999, BS EN ISO 10666:1999 and ISO 1460:1992.

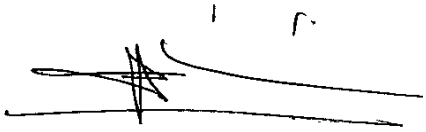
The Technical Expert Panels are in the opinion that this lightweight steel structure is suitable to be used in Malaysia provided that it complies with the terms and condition mentioned in this report. Additional requirement proposed by Technical Expert Panels are as follows:

i. A competent and professional design engineer has to be engaged to undertake all design work.

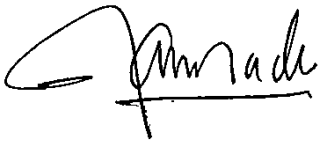
ii. Since there is no test on product being done, the Technical Expert Panels suggest the following series of tests which include tensile, bending, impact (Charpy), hardness (Brinell, Rockwell), connection and portal frame test to be done at any CIDB approved lab.

Ir. Dr Zuhairi Abd. Hamid
Chairman
Technical Opinion Expert Panel

Prof. Ir. Dr. Abdul Karim Mirasa
Technical Opinion Expert Panel



Prof. Ir. Dr. Wan Hamidon Wan Badarruzaman
Technical Opinion Expert Panel



Dr. Samsul Bahar Sadli
Technical Opinion Expert Panel

October 2011

10. REFERENCES

Book

MacGinley, T.J. (1993). Structural Steelwork : Design to Limit State Theory : Butterworth – Heinemann

BS 5950 : Part 1 : 2000 : Structural Use of Steelwork in Building

Website

http://www.wirakerjaya.com.my/ (30 September 2011)

http://www.csres.com/detail/192633.html (30 September 2011)

http://www.hdgasa.org.za/Journals/indSearchs/L/Lightweight%20steel.pdf (30 September 2011)

http://en.wikipedia.org/wiki/Cold_formed_steel (30 September 2011)

APPENDIX A

SITE VISIT PHOTOS

Date of Visit : 27th January 2011

Venue : Site at Port Klang Free Zone (PKFZ)

Figure 1 : Technical visit at Wira Kerjaya's factory

Figure 2 : Steel frame of typical lattice steel structure

Figure 3 : Effect of corrosion between galvanized steel frame and nails (Exposed to marine environment)

Figure 4 : Connection method between the components

Figure 5 : Lightweight infill wall system.

Figure 6 : Completed double storey bungalow at PKFZ

APPENDIX B

MANUFACTURING PROCESS

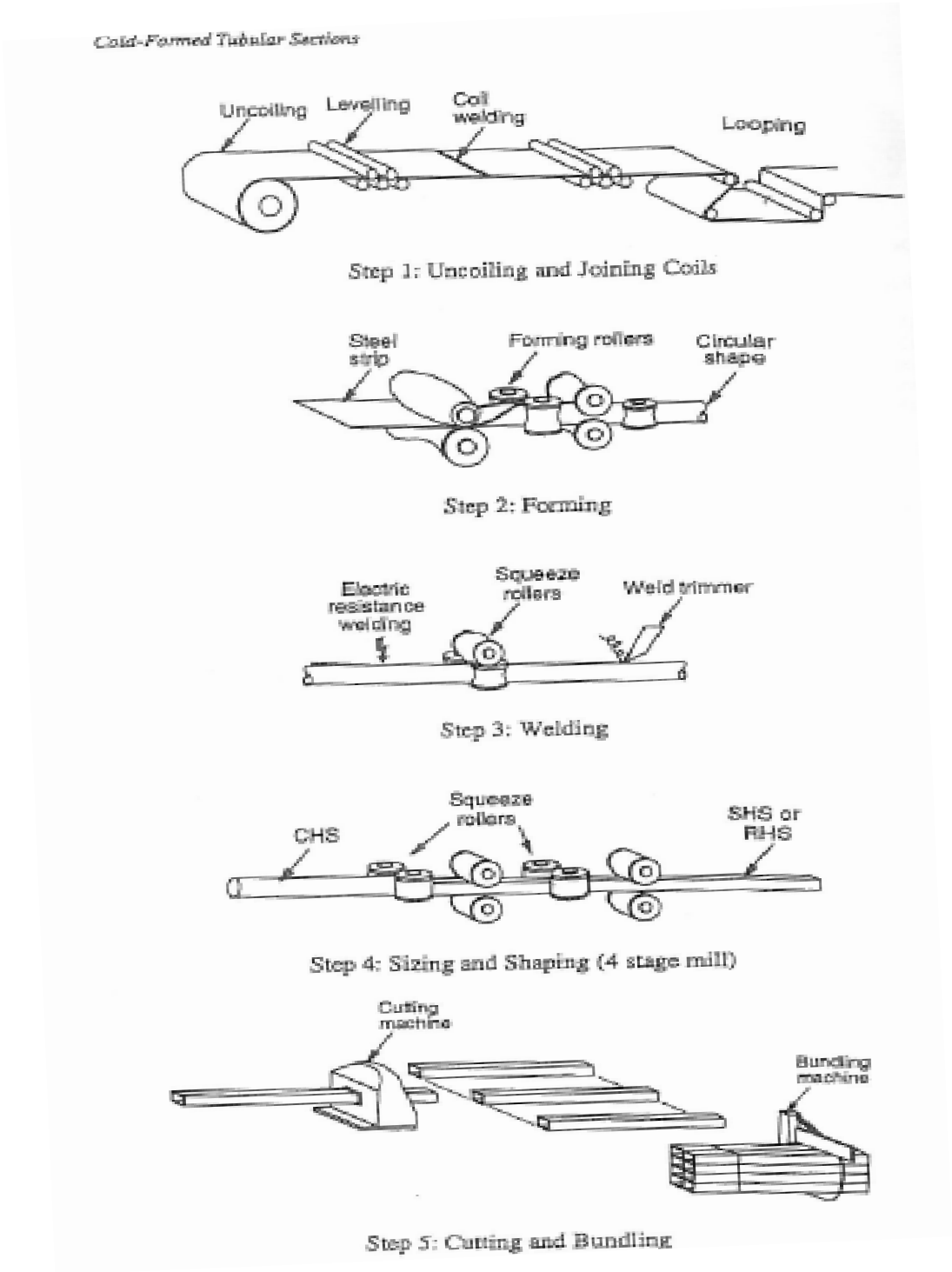
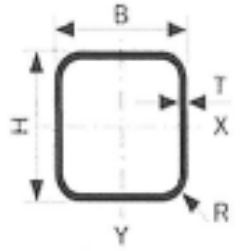


Figure 7 : The Manufacturing Process of Lightweight Steel (RHS & SHS)

APPENDIX C

SECTION PROPERTIES FOR RHS AND SHS PROVIDED BY WKSB

WIRA ECO BUILDING SYSTEM (WEBS)
RECTANGULAR HOLLOW SECTIONS

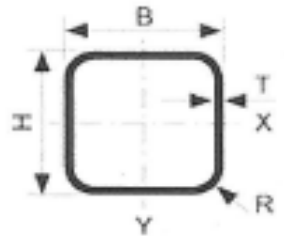


DIMENSIONS AND PROPERTIES

Dimensions			Mass Per Metre	Area of Section	Second Moment of Area		Radius of Gyration		Elastic Section Modulus		Plastic Section Modulus		Torsional Constant		Superficial Area per metre length
					Major	Minor	Major	Minor	Major	Minor	Major	Minor	Inertia	Modulus	
B	H	T	M	A	I_{yy}	I_{zz}	i_{yy}	i_{zz}	W_{elyy}	W_{elzz}	W_{plyy}	W_{plzz}	I_t	C_t	A_s
mm	mm	mm	kg/m	cm^2	cm^4	cm^4	cm^3	cm^3	cm^3	cm^3	cm^3	cm^3	cm^4	cm^3	m^2/m
30	60	0.8	1.10	1.40	6.715	2.205	2.192	1.256	2.238	0.735	2.736	1.675	5.47	2.66	0.1773
30	60	1.0	1.36	1.73	8.245	2.661	2.180	1.239	2.748	0.887	3.375	2.055	6.74	3.26	0.1766
30	60	1.2	1.62	2.07	9.718	3.080	2.169	1.221	3.239	1.027	3.997	2.420	7.98	3.83	0.1759
30	60	1.5	2.00	2.55	11.820	3.639	2.152	1.194	3.940	1.213	4.897	2.940	9.77	4.64	0.1748
30	60	2.0	2.62	3.34	15.046	4.394	2.123	1.148	5.015	1.465	6.311	3.731	12.57	5.88	0.1731
40	60	0.8	1.22	1.56	8.117	4.297	2.283	1.661	2.706	1.432	3.209	2.422	8.84	3.59	0.1973
40	60	1.0	1.52	1.93	9.986	5.250	2.272	1.647	3.329	1.750	3.965	2.985	10.94	4.42	0.1966
40	60	1.2	1.81	2.31	11.792	6.156	2.262	1.634	3.931	2.052	4.703	3.531	12.98	5.21	0.1959
40	60	1.5	2.24	2.85	14.387	7.428	2.246	1.614	4.796	2.476	5.775	4.320	15.97	6.35	0.1948
40	60	2.0	2.93	3.74	18.412	9.324	2.220	1.580	6.137	3.108	7.471	5.551	20.70	8.12	0.1931
50	70	0.8	1.47	1.88	13.644	8.090	2.695	2.076	3.898	2.311	4.582	3.635	15.79	5.30	0.2373
50	70	1.0	1.83	2.33	16.832	9.936	2.685	2.063	4.809	2.839	5.672	4.492	19.57	6.54	0.2366
50	70	1.2	2.19	2.79	19.932	11.713	2.675	2.051	5.695	3.346	6.741	5.330	23.29	7.73	0.2359
50	70	1.5	2.71	3.45	24.420	14.251	2.660	2.032	6.977	4.072	8.303	6.548	28.73	9.47	0.2348
50	70	2.0	3.56	4.54	31.475	18.147	2.634	2.000	8.993	5.185	10.799	8.479	37.45	12.20	0.2331

**Note : For explanations of tables please refer BS EN 10219-2:2006*

WIRA ECO BUILDING SYSTEM (WEBS)
SQUARE HOLLOW SECTIONS



DIMENSIONS AND PROPERTIES

Dimensions			Mass Per Metre	Area of Section	Second Moment of Area	Radius of Gyration	Elastic Section Modulus	Plastic Section Modulus	Torsional Constant		Superficial Area per metre length
									Inertia	Modulus	
B	H	T	M	A	I_{yy}	i_{yy}	$W_{el,yy}$	$W_{pl,yy}$	I_t	C_t	A_s
mm	mm	mm	kg/m	cm^2	cm^4	cm^3	cm^3	cm^3	cm^4	cm^4	m^2/m
30	30	0.8	0.72	0.92	1.293	1.187	0.862	0.999	2.02	1.29	0.1173
30	30	1.0	0.89	1.13	1.571	1.177	1.048	1.224	2.49	1.57	0.1166
30	30	1.2	1.06	1.35	1.833	1.167	1.222	1.439	2.93	1.84	0.1159
30	30	1.5	1.30	1.65	2.196	1.153	1.464	1.744	3.57	2.21	0.1148
30	30	2.0	1.68	2.14	2.722	1.129	1.815	2.205	4.54	2.75	0.1131
40	40	0.8	0.97	1.24	3.149	1.595	1.575	1.812	4.88	2.36	0.1573
40	40	1.0	1.20	1.53	3.856	1.585	1.928	2.231	6.02	2.89	0.1566
40	40	1.2	1.43	1.83	4.532	1.576	2.266	2.637	7.13	3.40	0.1559
40	40	1.5	1.77	2.25	5.490	1.561	2.745	3.222	8.75	4.13	0.1548
40	40	2.0	2.31	2.94	6.940	1.537	3.470	4.134	11.28	5.23	0.1531

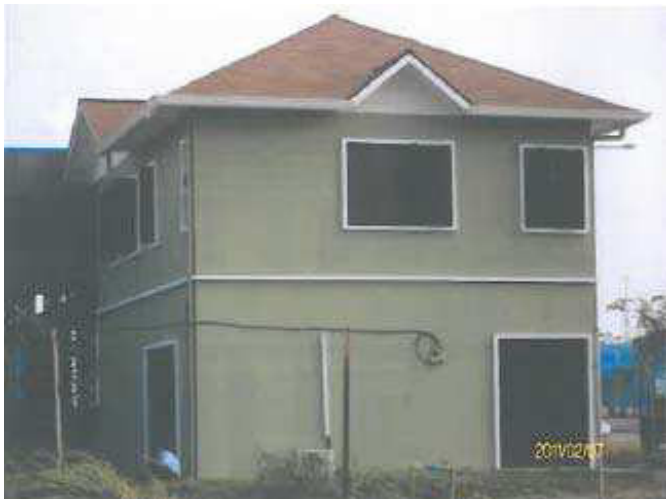
**Note : For explanations of tables please refer BS EN 10219-2:2006*

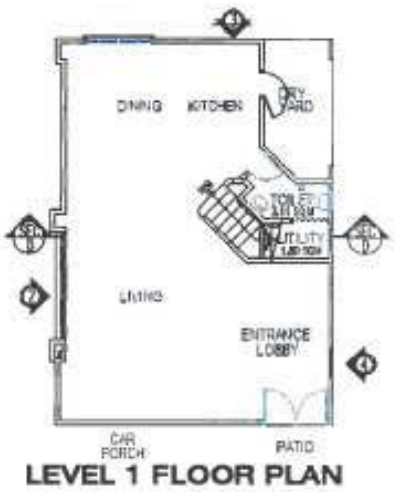
APPENDIX D

DESIGN ANALYSIS

A. Overview of the Project

WKSB had constructed a double storey bungalow at PKFZ, Port Klang. The height of the first floor is 3.5m. The height of the second floor is 3.1m; build-up area is 157.5m^2. The frame is based on a Lattice of Light-Weight Steel Structure form. Figure 8 show the layout of the floor plans and elevation of the building. The design of this building was done by WKSB.





LEVEL 1 FLOOR PLAN

LEVEL 2 FLOOR PLAN

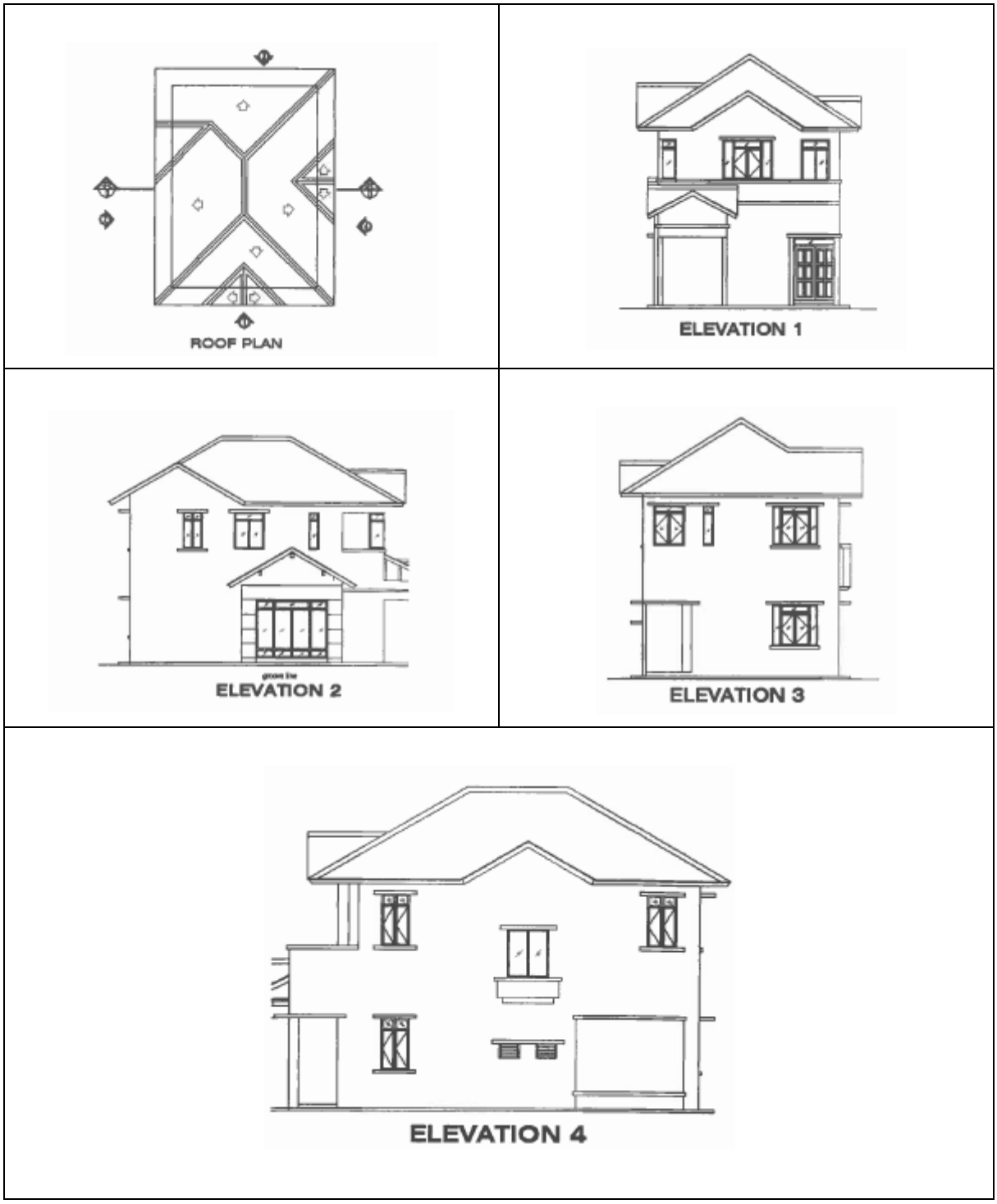


Figure 8 :Completed layout of double storey house, the floor plans and elevation of the building

The detail design characteristic and calculation were provided by WKSB and are as follow:

1.0 Introduction

This part of the design defines the interacting requirements for design of Structural Works for Double storey house (Sample House).

2.0 Reference standards

General

The design and construction of all structure and foundation works shall comply with the Uniform Building by Law 1984 and relevant Codes of Practice and Standards.

Design and Construction Standards

The following Code of Practice and Standards shall be applicable

a) BS 5950 : Part 1 : 2000 – Structural use of steelwork in building
b) BS 6399 : Part 1 : 1996 – Design Loading for Building
c) BS EN 10219 : Part 1 : 1994– Technical Delivery Requirements
d) BS EN 10219 : Part 2 : 1997– Tolerances, dimensions and sectional properties

3.0 Structural Criteria

General

Structural design criteria are in accordance with the Uniform Building By Laws and relevant design code of practices and standards.

Building Design Loads

Dead Loads

Dead loads are load due to the weight of structural elements, walls, permanent partitions, floors, roods, finished and all other construction materials. The relevant dead loads are as follow :

Reinforced Concrete	=	24.0 kN/m^3
Steel	=	79.0 kN/m^3
Metal Deck Roofing	=	0.15 kN/m^2
Roof Tiles	=	0.75 kN/m^2

Superimposed Dead Loads

Weight of all permanent finished and non-structural items, such as partition walls, parapets, concrete screed and waterproofing, floor finished, M&E services, etc.

a) Floors and Ceiling :-

Ceiling	=	0.20 kN/m^2
Mechanical and Electrical services	=	0.30 kN/m^2
Floor Finished	=	1.20 kN/m^2
Screed and protective concrete to RC flat roof	=	1.80 kN/m^2

Live Loads

The load assumed to be produced by the intended occupancy or use, including the weight of movable partitions. The relevant live loads are as follow:

R.C Flat Roof	=	1.5 kN/m^2
Self-contained dwelling Units	=	1.5 kN/m^2
Staircase / Corridor	=	4.0 kN/m^2

Load Combinations

All structure elements shall be designed to the following load combinations, where applicable:-

a) 1.4 Dead Load + 1.6 Live Load
b) 1.4 Dead load
c) 1.2 Dead Load + 1.2 Live Load

4.0 Design Methods

Structures shall be designed based on the limit states design. All the structures shall be designed by considering the limit states at which they become unfit for their intended use, by applying factors for the Ultimate Limit State (ULS) and the Servioeability Limit State (SLS). The SLS includes strength and stability against overturning / sway. Deflection shall be checked for the SLS.

Cold-formed steel components are designed with Commercial structural engineering software package, an integrated structural analysis STAAD.Pro V8i and design software.

5.0 Design Materials

Structural Steel

All cold-formed steel sections shall be grade 50 conforming to BS EN 10219 : Part 2 : 1997with :-

Minimum Yield Strength, fy = 355 kN/m^2

Self-Tapping Screws

Small pole connector, upper and lower level steel frame connector, column-to-beam join ST4.2, ST4.8, ST5.5 self tapping screw.

Figure 9 : Self tapping screw

B. STAADPro Analysis

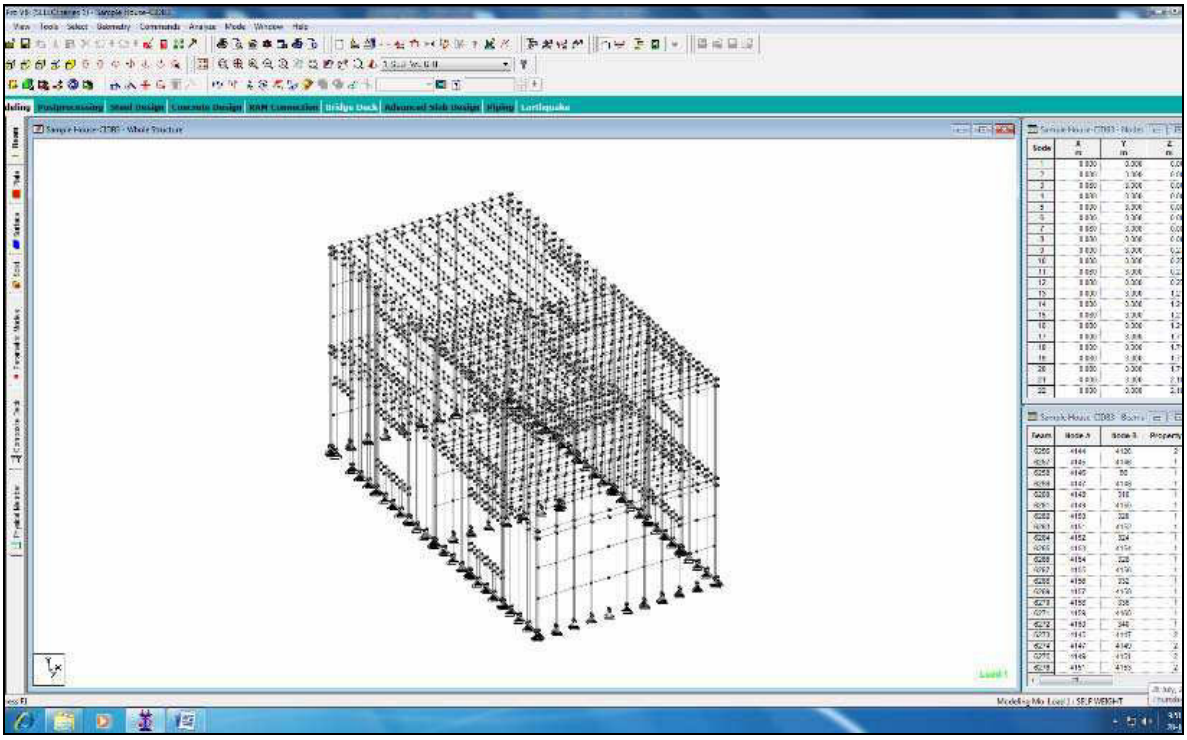


Figure 10 : 3 D view of double storey house model in STAADPro.

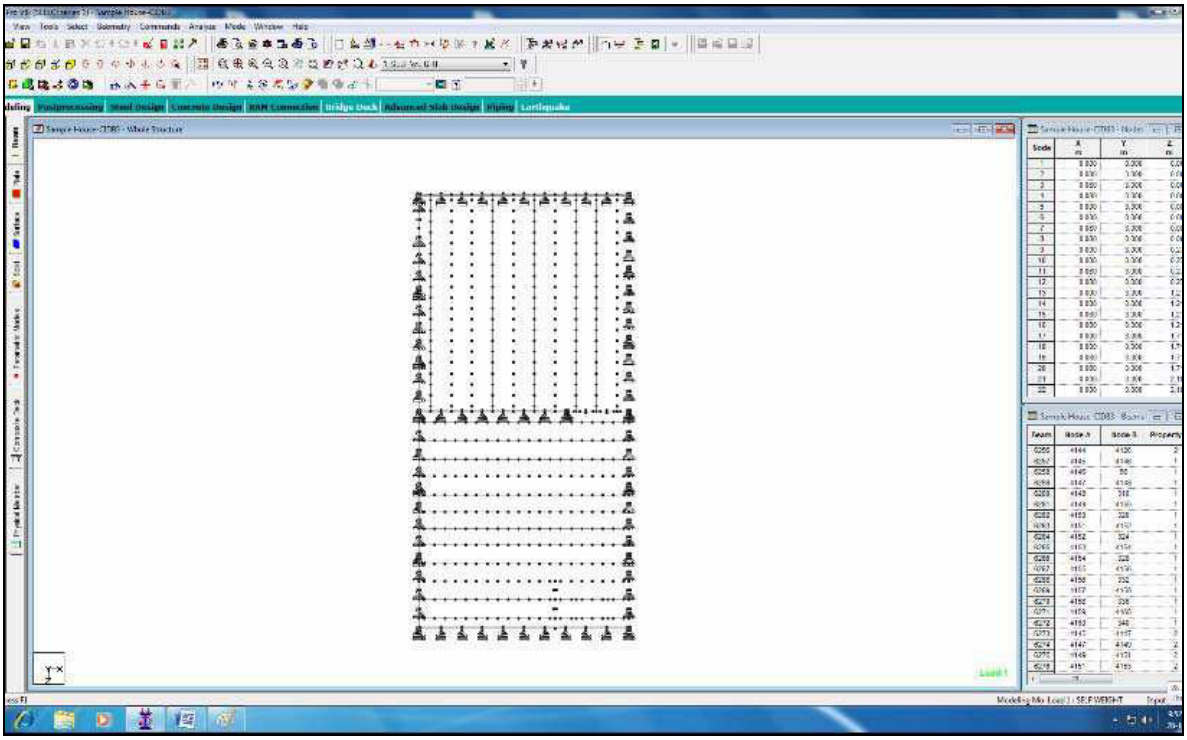


Figure 11 : Plan view.

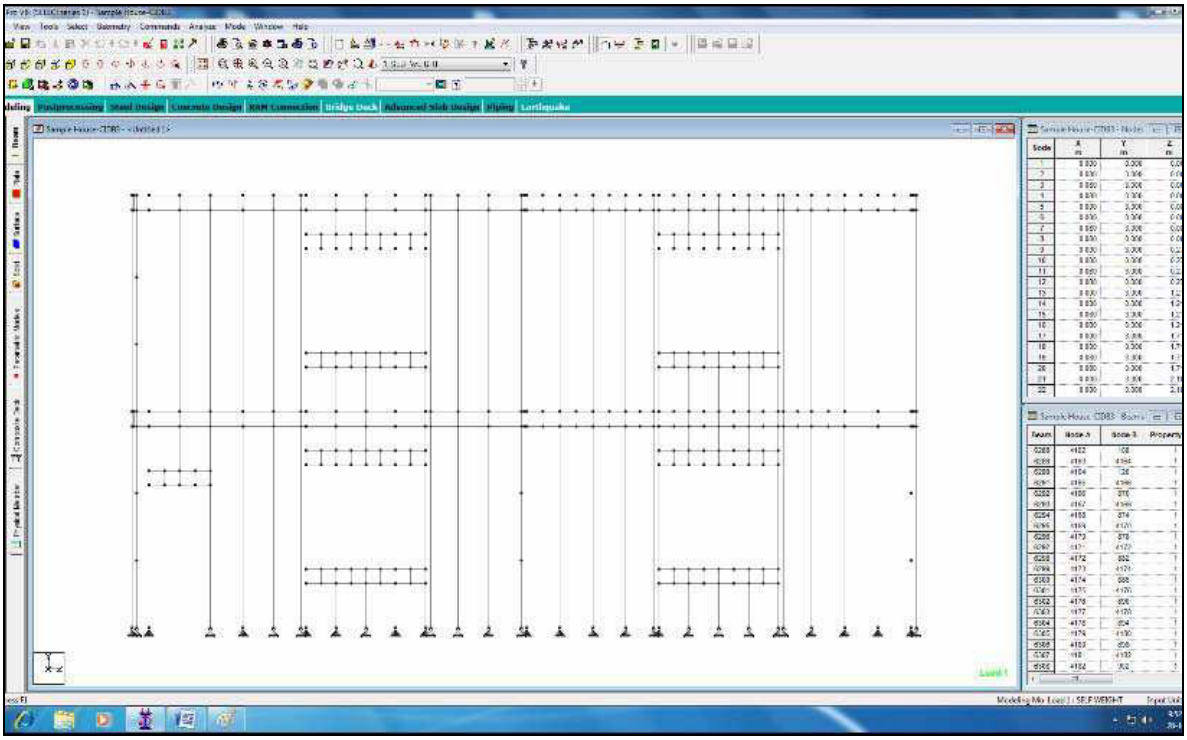


Figure 12 : Front view.

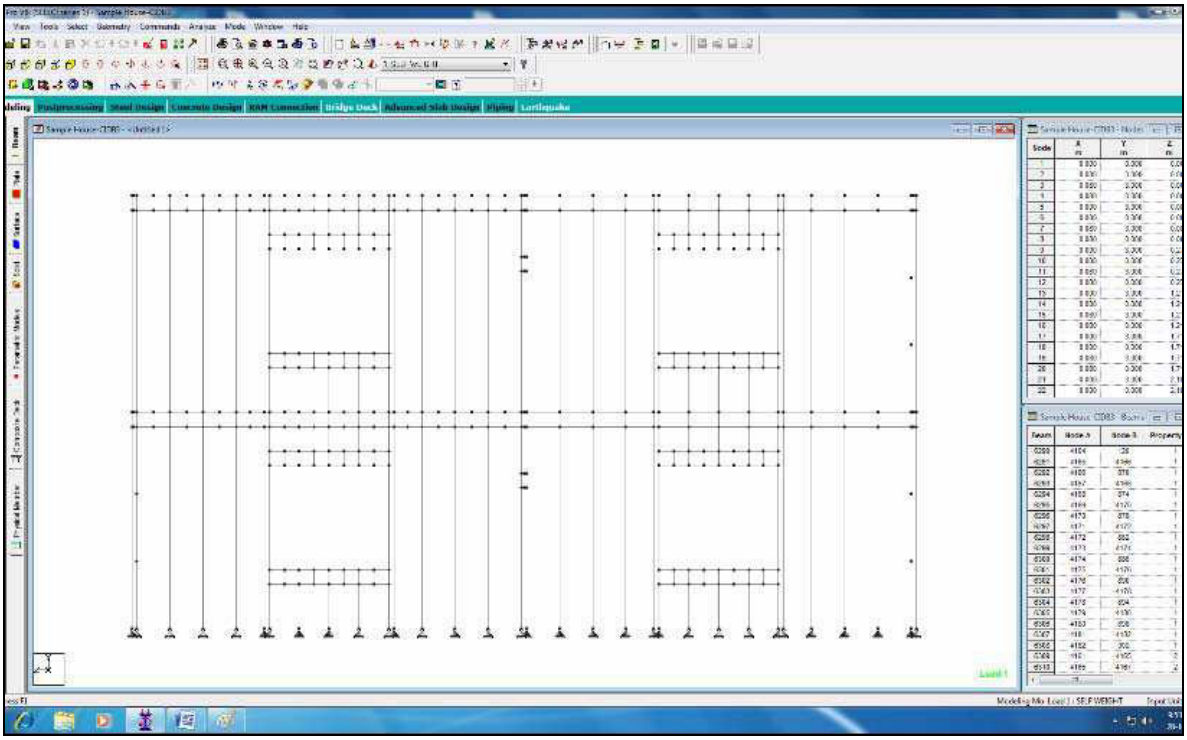


Figure 13 : Rear view.

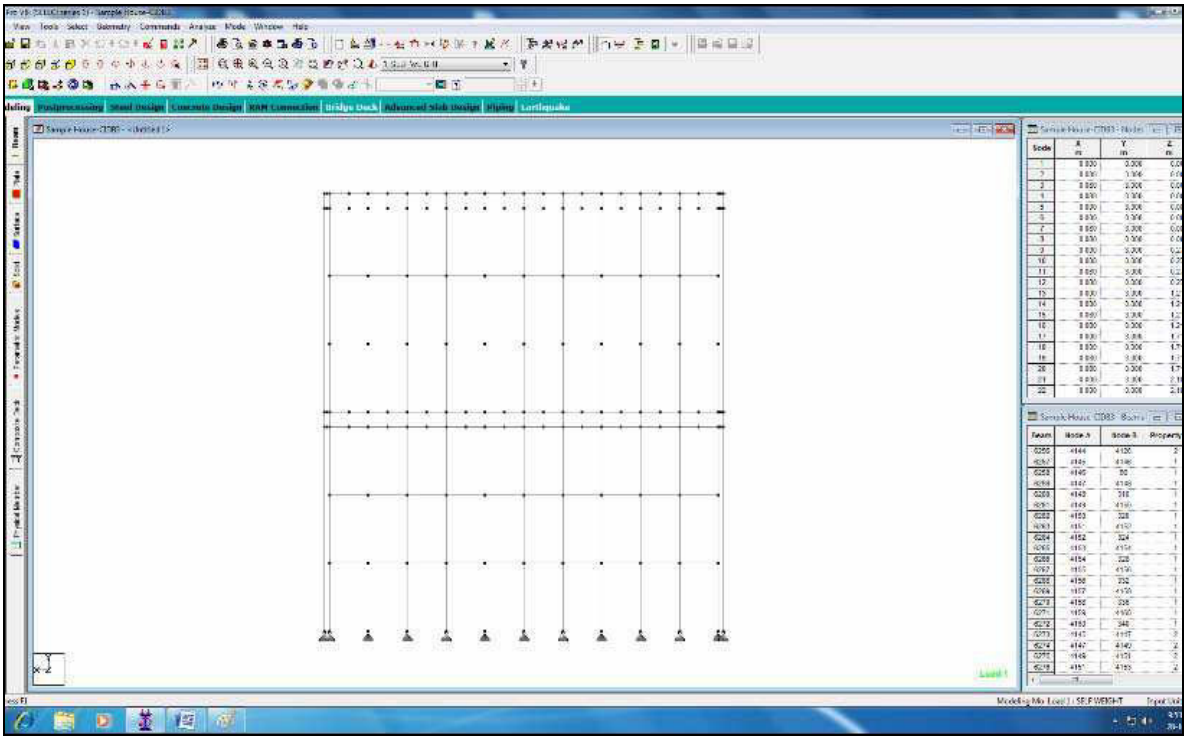


Figure 14 : Side view.

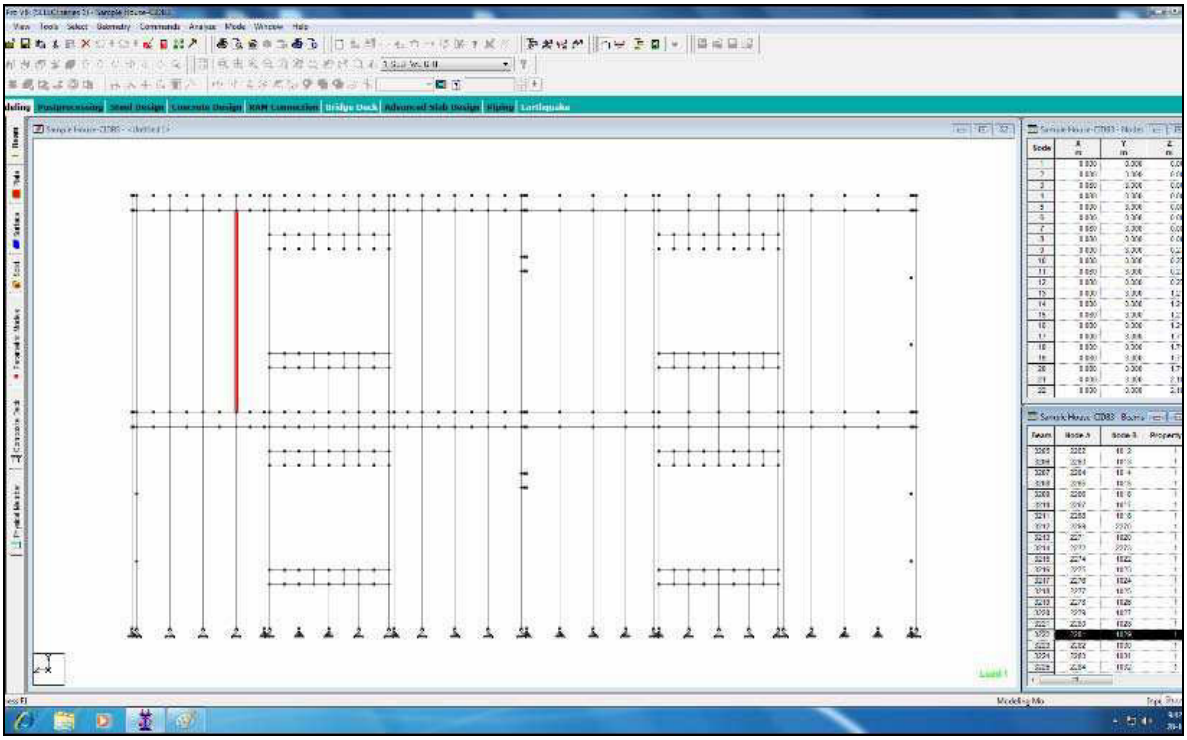


Figure 15: The location of column 3222.

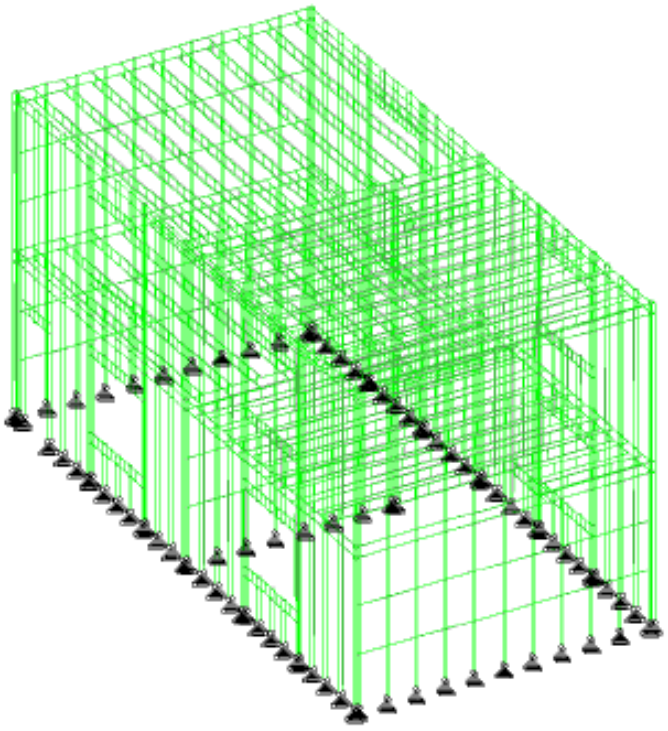


Figure 16: STAADPro Model

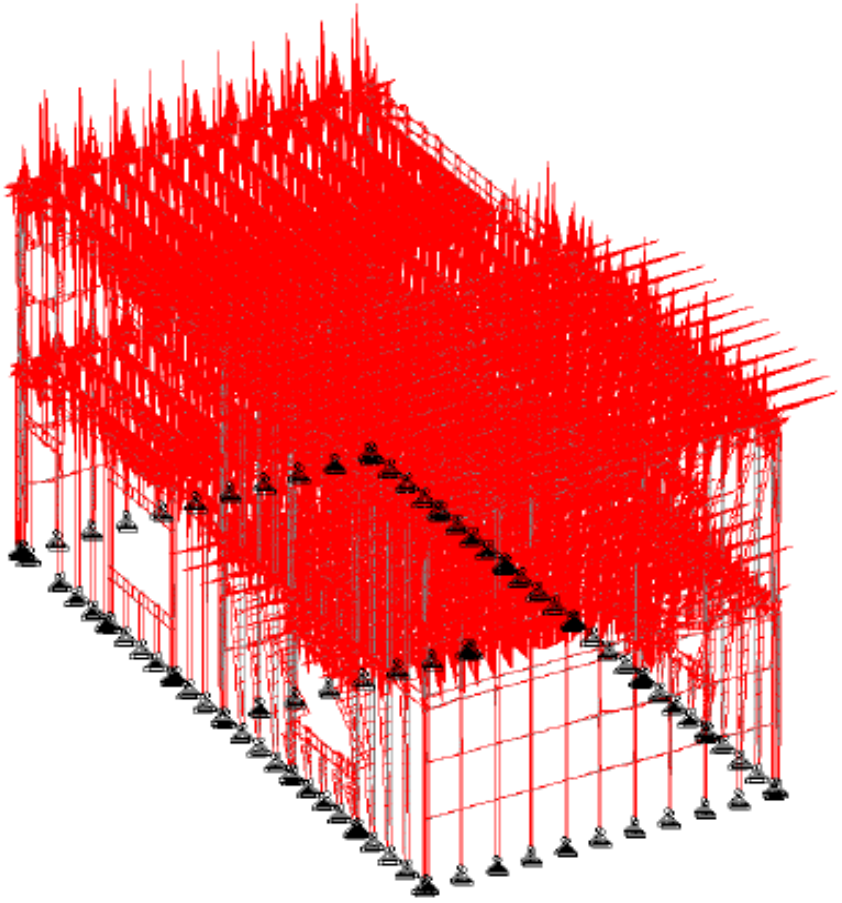


Figure 17: 3D view of bending moment diagram

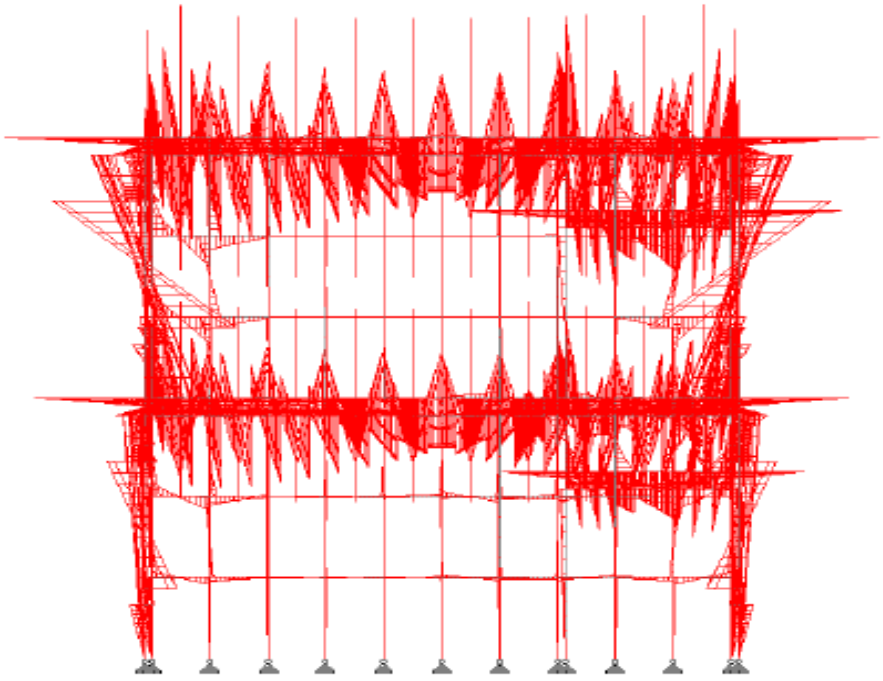


Figure 18: Side view of bending moment diagram

C. Design Example based on Column Stud (Beam 3222)

WIRA KERJAYA SDN BHD Sheet ___ of ___

Project	:	Double Storey House (Sample House)	Date	:	
Item	:	Column Stud (Beam 3222)	Designed by	:	SRH
			Checked by	:	MAF

Reference	Calculation	Output
BS 5950 : Part 1: 2000	**Column Stud**	
	F_c	
	3 m	
	Section Size	
	40 x 40 x 2.0 SHS (Grade 50)	
	Design Strength, P_y	
Table 9	t = 2.0 mm < 16.0 mm	
	$\therefore P_y$ = 355 N/mm^2	
	F_c = 7.97 kN (From STAAD.Pro)	
	M_x = 0.3675 kNm (From STAAD.Pro)	
	M_y = 0.007 kNm (From STAAD.Pro)	
	Section Classification	
	D = 40 mm	
	B = 40 mm	
	t = 2.0 mm	
	r_x = 1.537 cm	
	r_y = 1.537 cm	
	A = 2.94 cm^2	
	S_x = 4.134 cm^3	
	S_y = 4.134 cm^3	
	Z_x = 3.47 cm^3	
	Z_y = 3.47 cm^3	
	b, d, X, Y, D, B	
	Since P_y = 355 N/mm^2	
	b = B - 3t d = D - 3t	
	$\varepsilon = \sqrt{\frac{275}{P_y}} = \sqrt{\frac{275}{355}} = 0.8801$	
Table 12	Semi-compact limit $\frac{b}{t}$ = 39 ε	

WIRA KERJAYA SDN BHD

Sheet ___ of ___

Project	: Double Storey House (Sample House)	Date	:
Item	: Column Stud (Beam 3222)	Designed by	: SRH
		Checked by	: MAF

Reference	Calculation	Output
	$\frac{b}{t} = \frac{40 - (3 \times 2.0)}{2.0} = 17.0 < 39\varepsilon = (34.3)$	
	$\frac{d}{t} = \frac{40 - (3 \times 2.0)}{2.0} = 17.0 < 39\varepsilon = (34.3)$	
	Since section is not slender, capacity will not be reduced by local buckling.	
	Reduced $P_{yr} = \frac{39^2 \times 275}{(\frac{d}{t})^2} = 1447.3$ N/mm^2	
	Slenderness, λ	
	Check Lower Column Length	
	L_{ex} and L_{ey} = 0.85 L	
	$\lambda_x = \frac{3 \times 0.85 \times 10^2}{1.537} = 165.91 < 180$	
	$\lambda_y = \frac{3 \times 0.85 \times 10^2}{1.537} = 165.91 < 180$ (governs)	
	Compressive Strength, p_c	
	Select Struct Table 27 (C)	
	For λ_y = 165.91 and P_{yr} = 355 N/mm^2	
	P_{cy} = 60 N/mm^2	

WIRA KERJAYA SDN BHD

Sheet ___ of ___

Project	:	Double Storey House (Sample House)	Date	:	
			Designed by	:	SRH
Item	:	Column Stud (Beam 3222)	Checked by	:	MAF

Reference	Calculation	Output

Buckling Resistance Moment, M_b

$M_b = S_x P_b$

For Hollow Sections the implication from the Note in 4.3.7.1 is that $M_b = S_x P_b$ provided that Lateral Torsional Buckling does not need to be checked.

As side Ratio D/B = 2

$$\therefore \quad M_b = \frac{413.4 \times 1447.3}{10^3} = 598.32 \text{ kNm}$$

Overall Buckling Check

$$\frac{F_c}{A_g P_c} + \frac{m M_x}{M_b} + \frac{m M_y}{P_y Z_y} \leq 1.0$$

$$\frac{7.97 \times 10^3}{2.94 \times 10^2 \times 60} + \frac{1 \times 0.37}{598.32} + \frac{1 \times 0.007}{355 \times 3.47}$$

$0.4524 < 1.0$

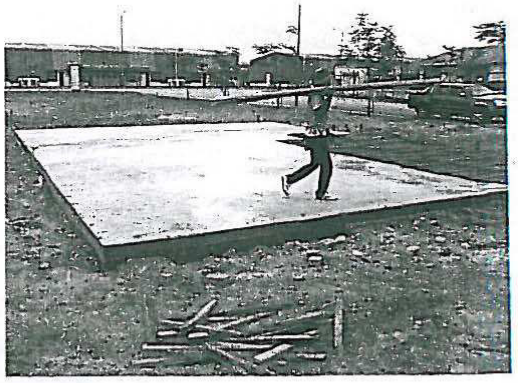
Section is satisfactory

APPENDIX E

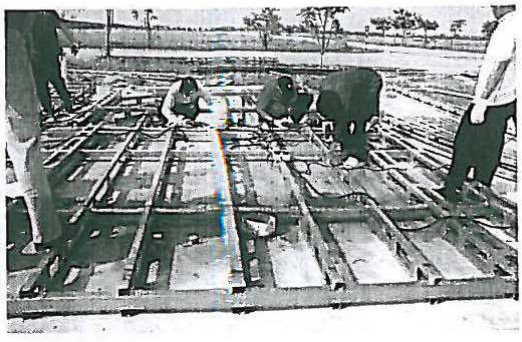
Typical Lightweight Structure Installation

Structural

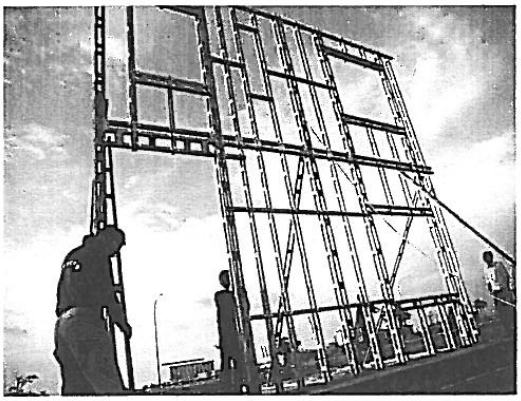
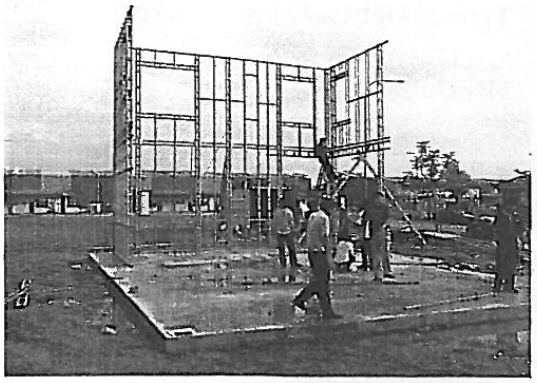
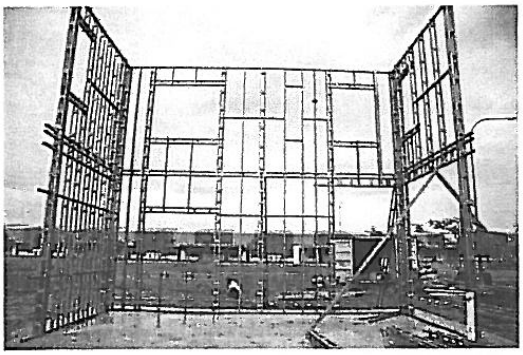
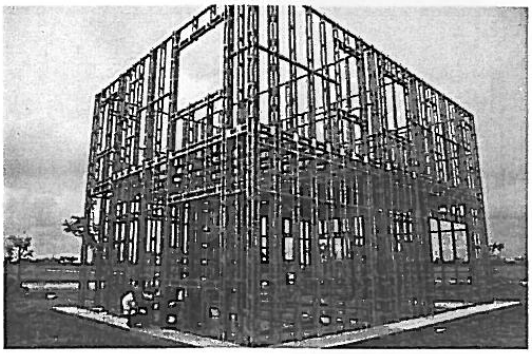
1. Foundation work



2. Wall members component such as column wall, stud and bracing are assemble at site.

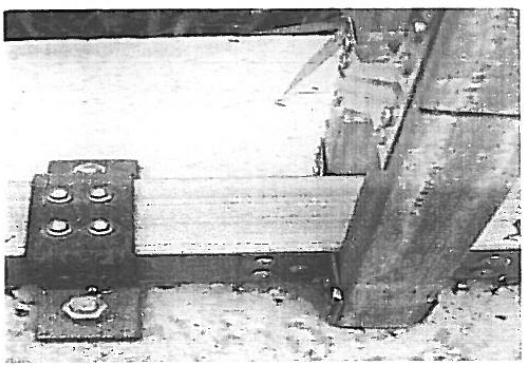


3. Wall installation: the finish assemble wall lift up bay by bay and secured at every edge of wall bay.

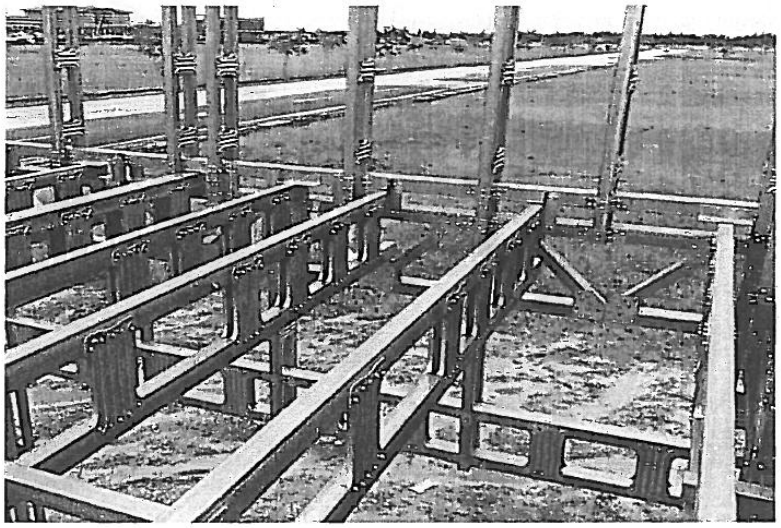





4. Foundation connector installation.

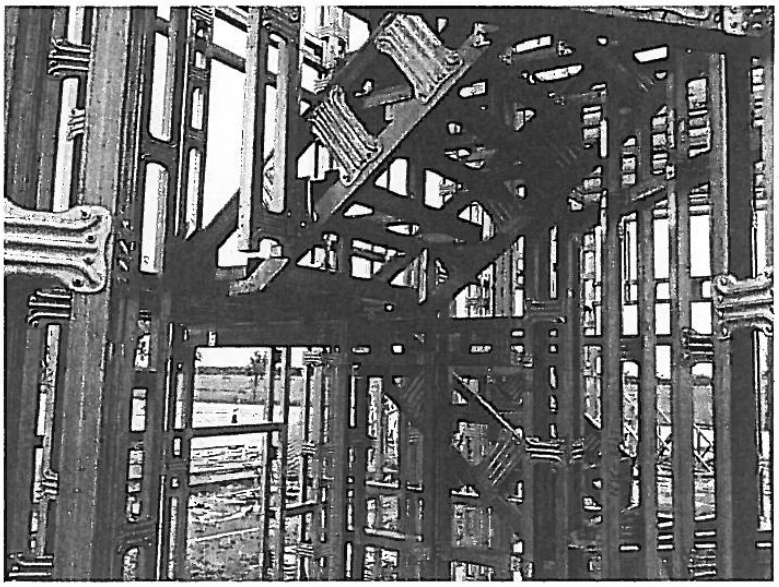




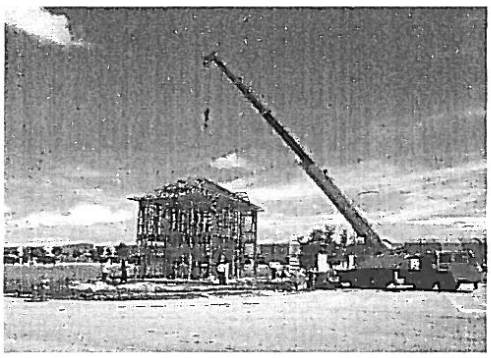
5. Floor beam installation.



6. Stairs installation



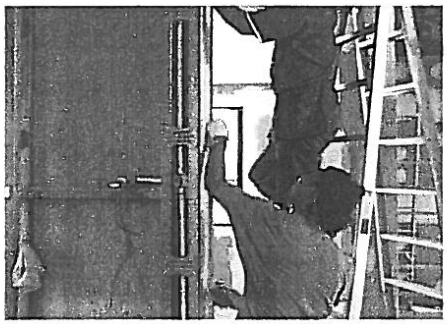
7. Roof truss installation.

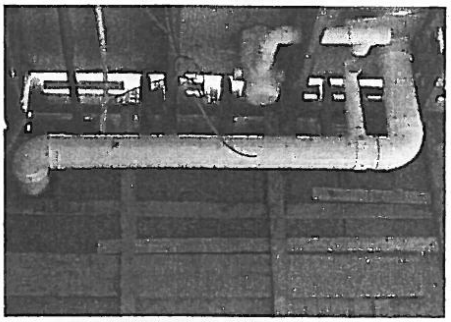


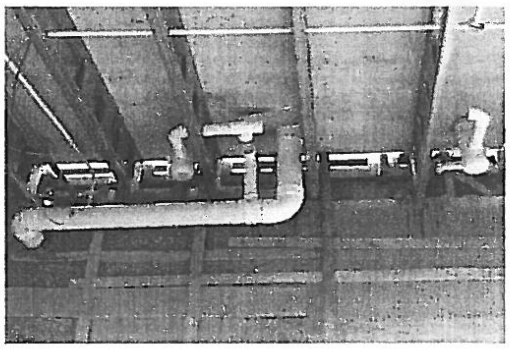
Finishes

a. Mechanical, Electrical and plumbing

1. The mechanical, electrical and plumbing services line has to be installed inside the wall and floor before concreting work take place.

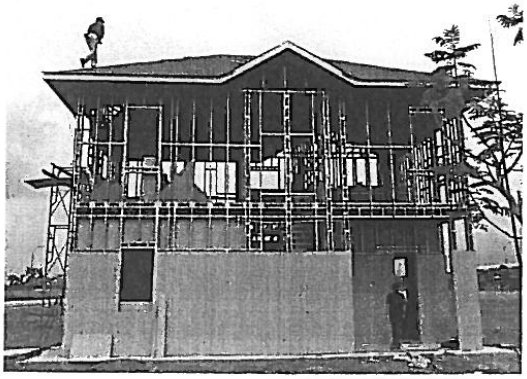


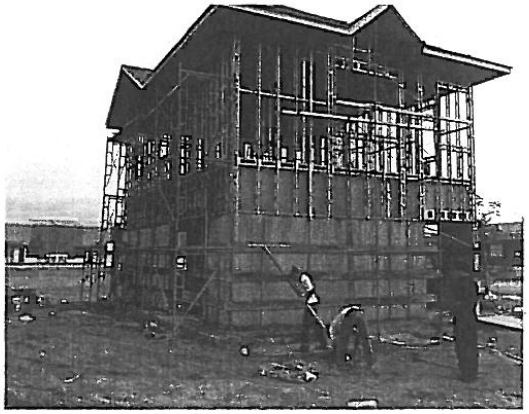


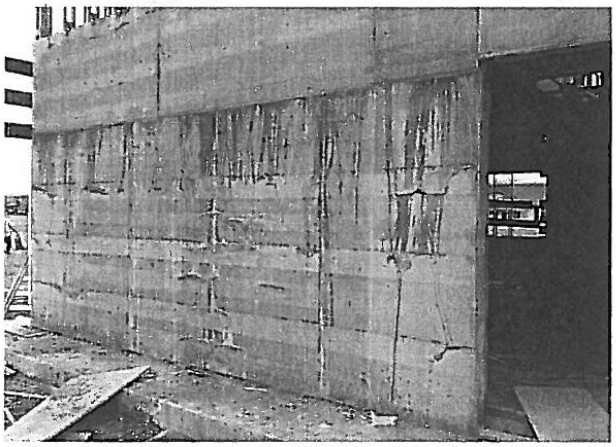


b. Wall

1. Wall cladding board to fix at both side of wall frame.
2. Lightweight concrete then pour into the wall as an infill.

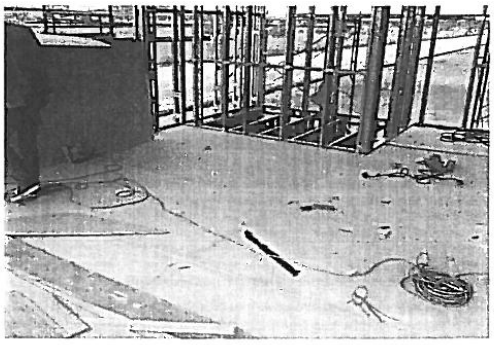






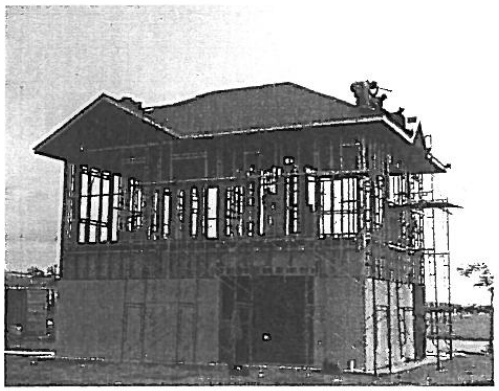
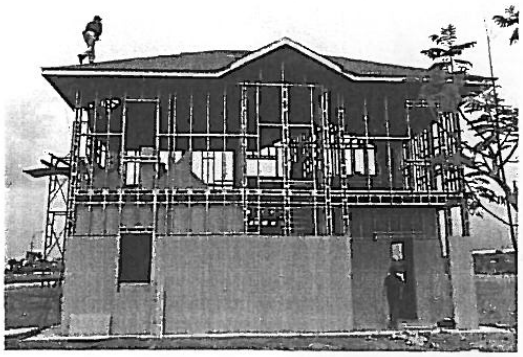
c. Floor

1. Cement board installation
2. BRC (wire mesh) installation
3. Light weight concrete use as finishing



d. Roof

1. Depend on type of roof finishes selection.(Example: shingles roof)

FINISH PRODUCT


APPENDIX F

TEST REPORT

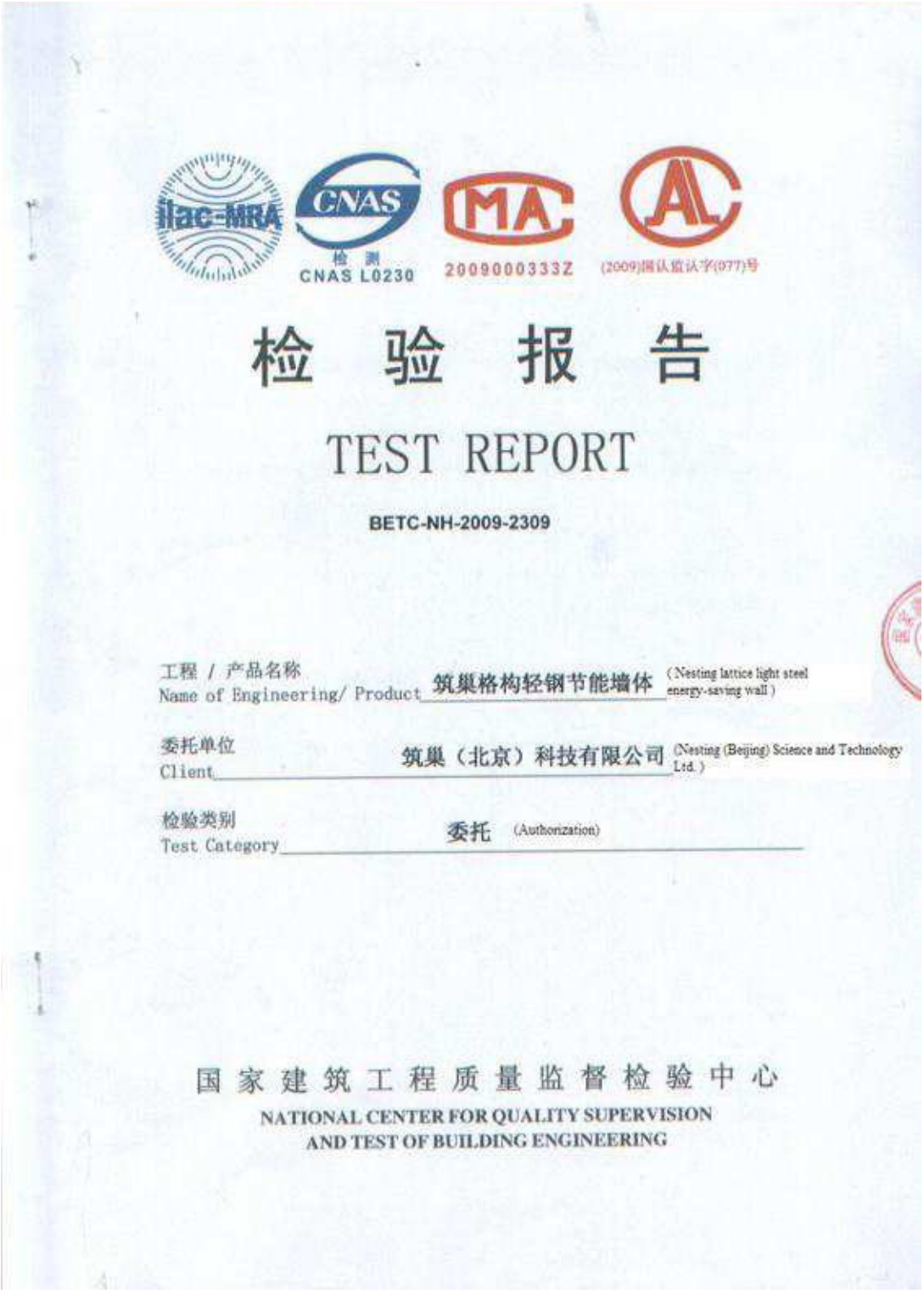
Note: Please contact the Applicant's representative for further information

WEBS

WIRA ECO BUILDING SYSTEMS

Lightweight Steel Structure - Energy Saving Wall Test

- **Wall Body Thermal Resistance**
- **Heat Transfer Coefficient**
- **Thermal Insulation of Fire Resistant Test**
- **Fire Resistant Test**



CNAS L0230

2009000333Z

(2009)国认监认字(077)号

检 验 报 告

TEST REPORT

BETC-NH-2009-2309

工程 / 产品名称
Name of Engineering/ Product 筑巢格构轻钢节能墙体 (Nesting lattice light steel energy-saving wall)

委托单位
Client 筑巢（北京）科技有限公司 (Nesting (Beijing) Science and Technology Ltd.)

检验类别
Test Category 委托 (Authorization)

国 家 建 筑 工 程 质 量 监 督 检 验 中 心

NATIONAL CENTER FOR QUALITY SUPERVISION
AND TEST OF BUILDING ENGINEERING

注 意 事 项
NOTICE

1. 报告无“检验鉴定章”或检验单位公章无效；

Test report is invalid without the " Stamp of test report" or that of test department on it.

2. 复制报告未重新加盖“检验鉴定章”或检验单位公章无效；

Duplication of test report is invalid without the " Stamp of test report" or that of test department re-stamped on it.

3. 报告无主检、审核、批准签字无效（仲裁检验报告应增加审定签字）；

Test report is invalid without the signatures of the persons for chief test, verification and approval. The test report for arbitration should be added the signature of the person for verification on it.

4. 报告涂改无效；

Test report is invalid if altered.

5. 对检验报告若有异议，应于收到报告之日起十五日内向检验单位提出；

Different opinions about test report should be reported to the test department within 15 days from the date of receiving the test report.

6. 一般情况，委托检验仅对来样负责。

In general ,for entrusted tests the responsibilities are undertaken for the delivered samples only.

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邮政编码(Post code)：100013
Internet: http://www.cabr-betc.com

国家建筑工程质量监督检验中心检验报告

NO. 36, Yanxi Economic Development Zone,
Huairou District, Beijing, 101400, PR CHINA

TEST REPORT OF NATIONAL CENTER FOR QUALITY SUPERVISION AND TEST OF BUILDING ENGINEERING

报告编号（No. of Report）：BETC—JN1—2009—181　　共 2 页　第 1 页（Page1 of 2）

委托单位（Client）		筑巢（北京）科技有限公司 Nesting (Beijing) Science and Technology Ltd.		
地址（ADD）		北京市怀柔区雁栖经济开发区雁栖大街 36 号	电话（Tel）	010-61676112
样品 (Sample)	名称（Name）	筑巢轻钢结构节能墙体 Nesting light steel structure energy-saving wall	状态 (State)	正常 Normal
	商标（Brand）	筑巢 Nesting	规格型号 (Type/Model)	（试样构造见附页）See attachment
生产单位（Manufacturer）		筑巢（北京）科技有限公司 Nesting (Beijing) Science and Technology Ltd		
送样/抽样日期（Date of delivery/ Sampling）		2009. 06. 12	地点 (Place)	——
工程名称 (Name of engineering)		——		
检验 (Test)	项目 (Item)	墙体热阻；传热系数 Wall body thermal resistance and heat transfer coefficient	数量 (Quantity)	1 组 1 Group
	地点 (Place)	试验室 Lab	日期 (Date)	2009. 07. 01～07. 03
	依据 (Reference documents)	GB/T 13475—2008 绝热 稳态传热性质的测定 标定和防护热箱法 determine and calibrate heat insulation, steady state and heat transfer characters, guarding heat-box method		
	设备 (Equipment)	JW-1 型墙体保温性能检测装置 JW-1 type wall insulation performance testing equipment		

检验结论（Conclusion）

墙体热阻 R=1.65m²·K/W (wall body thermal resistance)

传热系数 K=0.56W/(m²·K) (heat transfer coefficient)

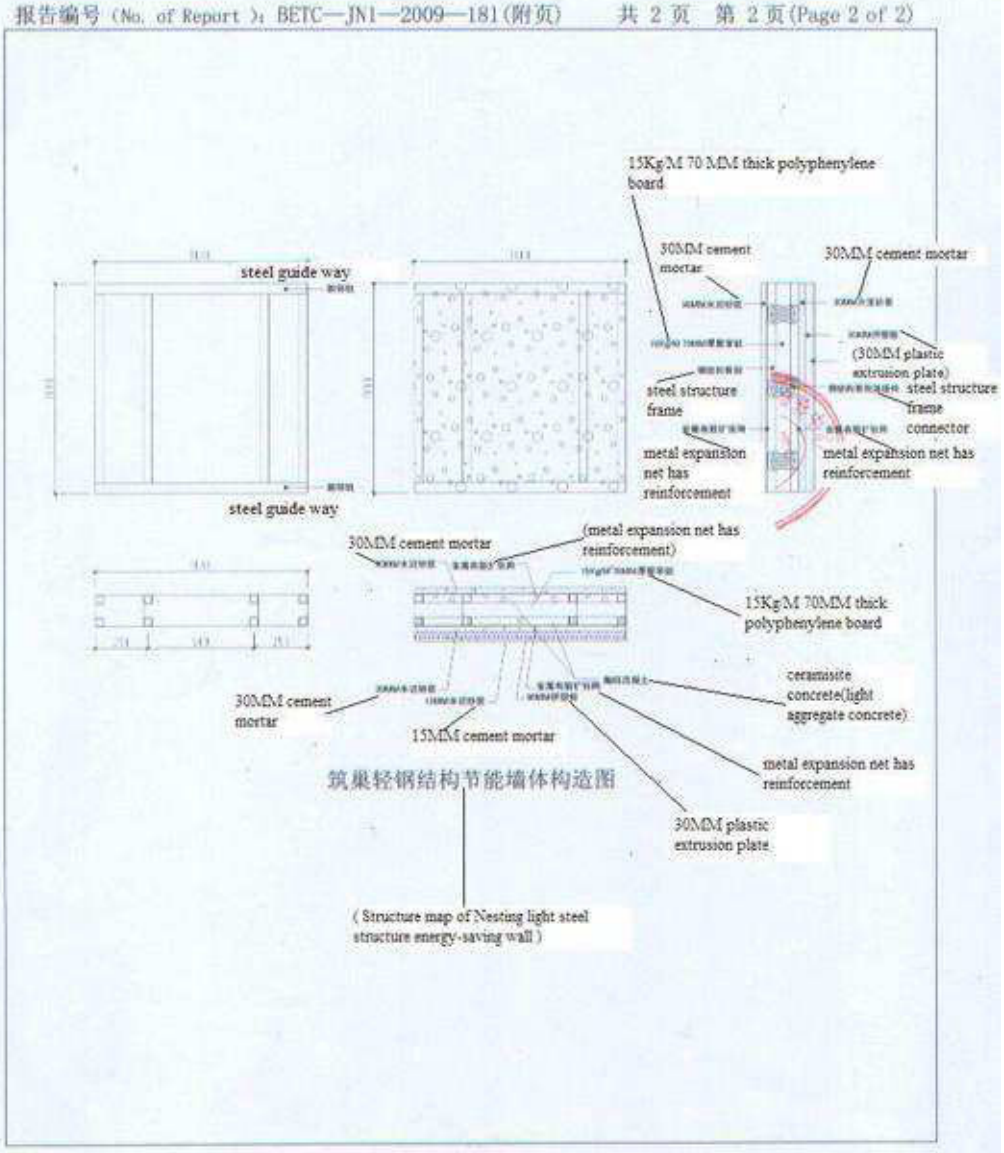
（本栏以下无正文）

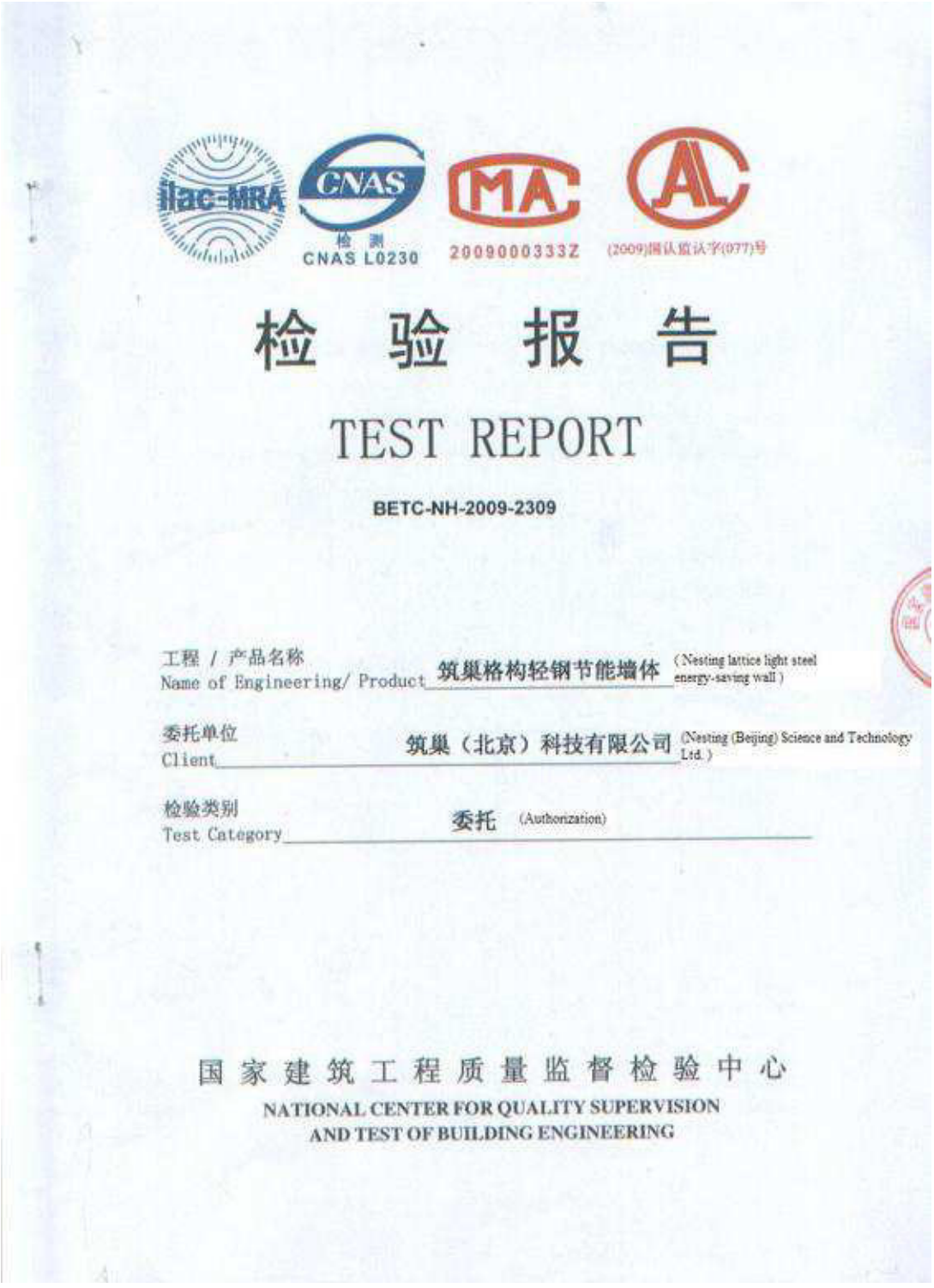
Hot room air temperature is 23.9 C, cold room air temperature is -8.4C

备注(Remarks)：	热室空气温度 23.9℃，冷室空气温度-8.4℃。			
批准(Approval)	审核(Verification)	主检(Chief tester)	联系电话(Tel)	报告日期(Date)
赵金秋	钱美丽	何成燕	010-88386983 010-88386985	2009. 07. 07

国家建筑工程质量监督检验中心检验报告

TEST REPORT OF NATIONAL CENTER FOR QUALITY SUPERVISION AND TEST OF BUILDING ENGINEERING





CNAS L0230

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(2009)国认监认字(077)号

检 验 报 告

TEST REPORT

BETC-NH-2009-2309

工程 / 产品名称
Name of Engineering/ Product 筑巢格构轻钢节能墙体 (Nesting lattice light steel energy-saving wall)

委托单位
Client 筑巢（北京）科技有限公司 (Nesting (Beijing) Science and Technology Ltd.)

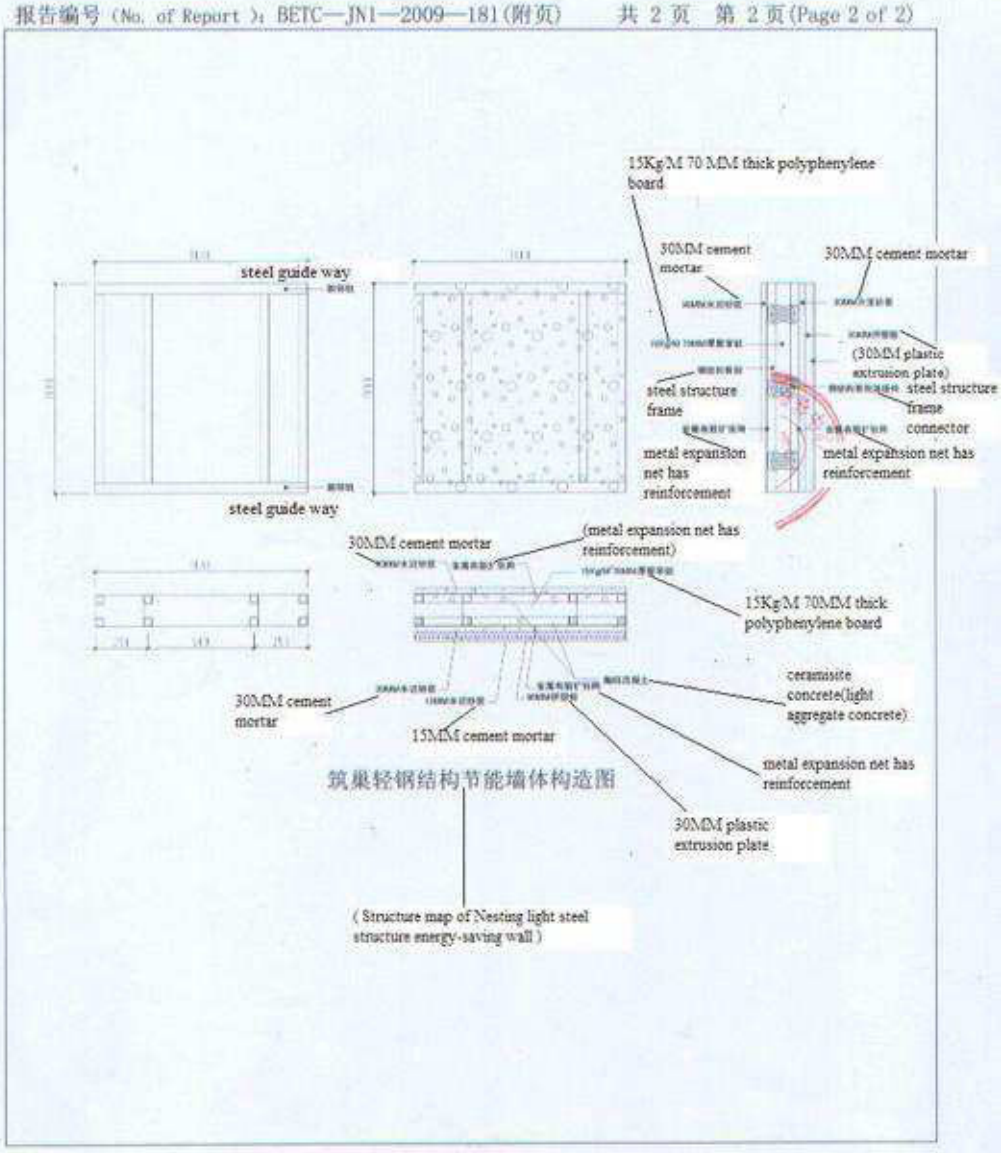
检验类别
Test Category 委托 (Authorization)

国 家 建 筑 工 程 质 量 监 督 检 验 中 心

NATIONAL CENTER FOR QUALITY SUPERVISION
AND TEST OF BUILDING ENGINEERING

国家建筑工程质量监督检验中心检验报告

TEST REPORT OF NATIONAL CENTER FOR QUALITY SUPERVISION AND TEST OF BUILDING ENGINEERING



注 意 事 项
NOTICE

1. 报告无“检验鉴定章”或检验单位公章无效；

Test report is invalid without the “ Stamp of test report” or that of test department on it.

2. 复制报告未重新加盖“检验鉴定章”或检验单位公章无效；

Duplication of test report is invalid without the “Stamp of test report” or that of test department re-stamped on it.

3. 报告无主检、审核、批准签字无效（仲裁检验报告应增加审定签字）；

Test report is invalid without the signatures of the persons for chief test, verification and approval. The test report for arbitration should be added the signature of the person for verification on it.

4. 报告涂改无效；

Test report is invalid if altered.

5. 对检验报告若有异议，应于收到报告之日起十五日内向检验单位提出；

Different opinions about test report should be reported to the test department within 15 days from the date of receiving the test report.

6. 一般情况，委托检验仅对来样负责。

In general ,for entrusted tests the responsibilities are undertaken for the delivered samples only.

地址： 北京市北三环东路 30 号
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国家建筑工程质量监督检验中心检验报告

(Nesting lattice light steel energy-saving wall)

TEST REPORT OF NATIONAL CENTER FOR QUALITY SUPERVISION AND TEST OF BUILDING ENGINEERING

No. 36, Yanxi Street, Yanxi Economic Development Zone, Huairou District Beijing, 101400, PR CHINA

报告编号（No. of report）：BETC-NH-2009-2309　　共 7 页 第 1 页（Page 1 of 7）

委托单位（Client）	筑巢（北京）科技有限公司 (Nesting (Beijing) Science and Technology Ltd.)			
地址（ADD）	北京怀柔区雁栖经济开发区雁栖大街 36 号		电话（Tel）	010-61676112
样品（Sample）	名称（Name）	筑巢格构轻钢节能墙体	状态（State）	完好（Good）
	商标（Brand）	筑巢 (Nesting)	规格型号（Type/Model）	3000mm×3000mm×200mm
生产单位（Manufacturer）	筑巢（北京）科技有限公司 (Nesting (Beijing) Science and Technology Ltd.)			
送样/抽样日期（Date of delivery/Sampling）	2009-8-21（送样）		地点（Place）	----
工程名称（Name of engineering）	----			
检验（Test）	项目（Item）	耐火性能 (fire - resistant)	数量（Quantity）	$9m^2$（2 块）
	地点（Place）	耐火试验室 (fireproof lab)	日期（Date）	2009-8-28
	依据（Reference Document）	GB/T9978.8-2008、GB/T9978.1-2008		
	设备（Equipment）	垂直构件耐火试验炉 (Vertical component fire test furnace)		

检验结论（Conclusion）

经检验，由筑巢（北京）科技有限公司生产并委托，尺寸为 3000mm（宽）×3000mm（高），厚度为 200mm 的筑巢格构轻钢节能墙体的耐火性能为：

(After examination, fire-resistant of Nesting lattice light steel energy-saving wall (size 300mm wide x 3000mm high x 200 mm thickness) which manufacture and entrusted by Nesting (Beijing) Science and Technology Ltd are as follows:)

完整性：≥181min (Integrality)
隔热性：≥181min (Thermal insulation)

（以下空白）

备注：

批准（Approval）	审核（Verification）	主检（Chief tester）	联系电话（Tel）	报告日期（Date）
			010-64517933	2009.9.4

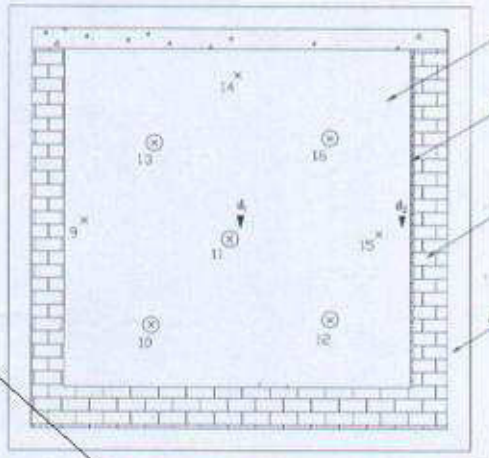
检验结果汇总 （Conclusion of Testing Result）

（Testing item）检验项目	标准条款 (Standard article)	判定准则 (verdict criteria)	检验结果 （Testing result）	结论 (Conclusion)
耐火性能 (Integrality fire-resistant) 完整性	(GB/T9978.1-2008 Article 10.2.2 Article 8.4) GB/T9978.1-2008 第 10.2.2 条 第 8.4 条	试件在耐火试验期间能够持续保持耐火隔火性能的时间。试件发生以下任一限定情况均认为试件丧失完整性： a) 棉垫试验，棉垫被点燃； b) ∮6mm 的缝隙探棒穿过试件进入炉内，并沿裂缝长度方向移动 150mm；∮25mm 的缝隙探棒穿过试件进入炉内； c) 背火面出现火焰并持续时间超过 10s。	(During fireproof testing period, sample can keep fire-resisting and fire insulated time. If anything happened as following item, it considers sample lost Integrality of fire-resistant：) 未出现 （Not happened） a) Cotton pad testing. Cotton pad on fire） b) 6mm gap sounding rod pass through sample go inside furnace, go along the crack 150mm；25mm gap sounding rod pass through sample go inside furnance）	≥181min
(Thermal insulation of fire-resistant) 隔热性	GB/T9978.1-2008 第 10.2.3 条 GB/T9978.1-2008 Article 10.2.3	试件在耐火试验期间持续保持耐火隔热性能的时间，试件背火面温度温升发生超过以下任一限定的情况均认为丧失隔热性： a) 平均温度温升超过初始平均温度 140℃； b) 任一点位置的温度温升超过初始温度（包括移动热电偶）180℃（初始温度应是试验开始时背火面的初始平均温度）。 （以下空白）	181min 时，背火面： 单点最高温升 48.5℃<180℃ 平均温升 36.4℃<140℃ (During fireproof testing period, sample can keep fire-resisting and fire-insulated time. If sample back side temperature increased as following item, it consider sample lost thermal insulation of fire-resistant) a) Average temperature increased more than initial average temperature 140C. b) Temperature on any single point more than initial temperature (including move thermocouple) 180C. Initial temperature is the initial average temperature on the side unexposed to fire when test start.	≥181min

检验数据及试件情况 Test data and sample condition

1. 试件背火面测点布置如图 1 所示，试验时墙体一侧为自由边，试件是由金属网、金属格构架、陶粒砼等组成的墙体，试件详图见附图（另附一页）。

1. Graph 1 is testing point arrangement on unexposed to fire side. During testing onsside of the wall is free side. Sample is the wall made of wire netting, metal lattice frame, sand hyalite concrete and so on. (Sample detail drawing refer attachment).



Graph 1 Sample testing point arrangement on unexposed to fire side.

Measuring temperature point on the unexposed to fire side.

图 1 试件背火面测点布置图

2. 背火面测温点试验数据见表 1，表内温度值为减去初始背火面平均温度的值，初始平均温度为 23℃ 。

2. Form 1 is data form for testing point arrangement on unexposed fo fire side, temperature value in the form is already subtract initial unexposed to fire side average temperature value. Initial average temperature is 23C.

背火面各测温点试验数据（℃）　　表 1 Form 1

Time / 时间 (min)

时间 (min)	10#	11#	12#	13#	16#	平均值 (℃) Average Value	9#	14#	15#
30	2.7	3.0	2.7	16.5	15.7	8.1	2.9	6.2	2.4
60	3.1	5.7	3.4	24.3	23.1	11.9	11.8	12.3	9.4
90	5.7	10.9	6.7	31.4	29.8	16.9	21.7	22.0	26.5
120	12.0	17.4	12.7	38.2	36.3	23.3	24.7	32.6	42.6
150	21.4	24.3	21.3	41.9	39.8	29.7	31.4	39.9	46.0
180	34.1	29.9	31.4	43.3	41.1	36.0	38.4	44.6	47.2
181	34.9	30.6	32.0	43.3	41.1	36.4	38.9	45.3	48.5

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检验数据及试件情况 Test data and sample condition

3. 试验现象：试验开始后 30min 时，有少量水汽溢出；其后一直有少量水汽溢出，无其他明显变化；181min 时，隔热性、完整性均未破坏，试验停止。

3. Test phenomena : 30 min after testing start, there are some water vapour spill over; after this there are some wter vapour continuously spill over. Others no significantly change; when 181 min, there is no damage in integrality and thermal insulation of fire-resistant. Testing stop.

4. 试验过程中的挠度变化如表 2 所示，表中（+）值为内凹变形，（-）值为外凸变形。

4. Form 2 is flexibility change during testing. (+) is inward curve deformation (_) is outer convex deformation.

Flexibility 挠度（mm）　　表 2

Time 时间(min)	挠度（mm）Flexibility 位置 d_1 Position	位置 d_2 Position
30	15	2
45	23	5
60	29	12
90	34	12
120	38	17
150	38	17
181	39	18

5. 升温曲线如图 2 所示。

5. Graph 2 is temperature rising curve.

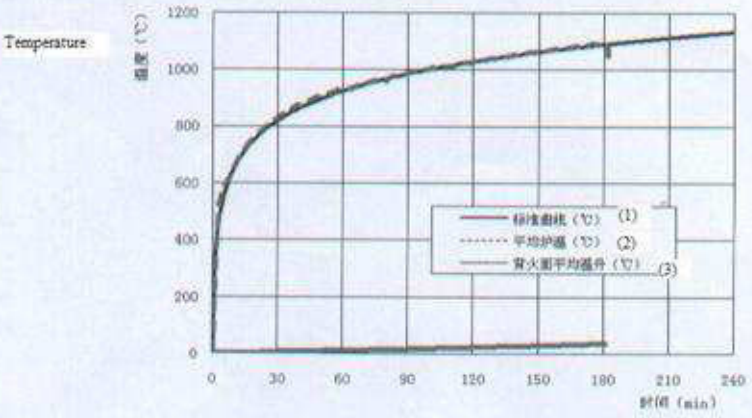


图 2　升温曲线图　Temperature rising curve

（以下空白）

(1) Standard curve

(2) Average furnace temperature

(3) Average temperature raise on the side unexposed to fire.

检验数据及试件情况

6. 炉顶下方 500mm 处压力曲线如图 3 所示。 6. Pressure curve under furnace top 500mm

Pressure

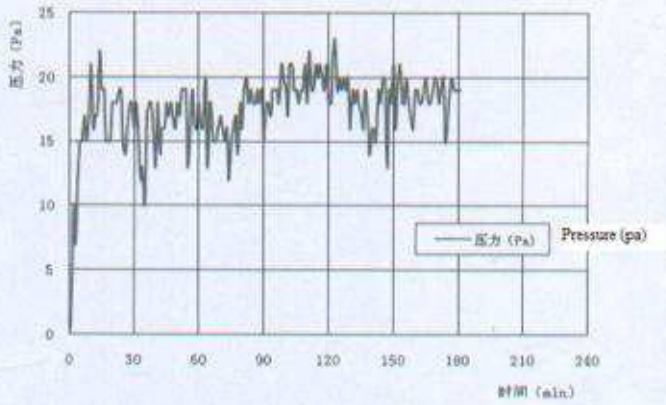


图 3　压力曲线图　Pressure Curve

（以下空白）

检验数据及试件情况

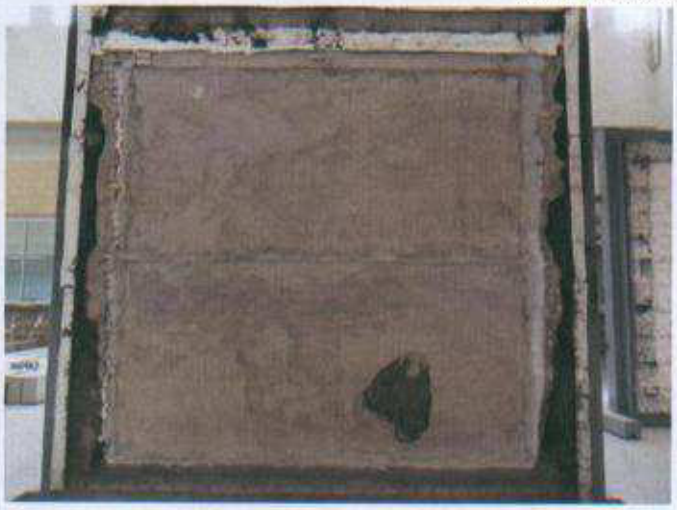
7. 试验照片。 Testing Picture

照片 1. 试验前试件向火面情况 Condition of surface on the fire before testing.

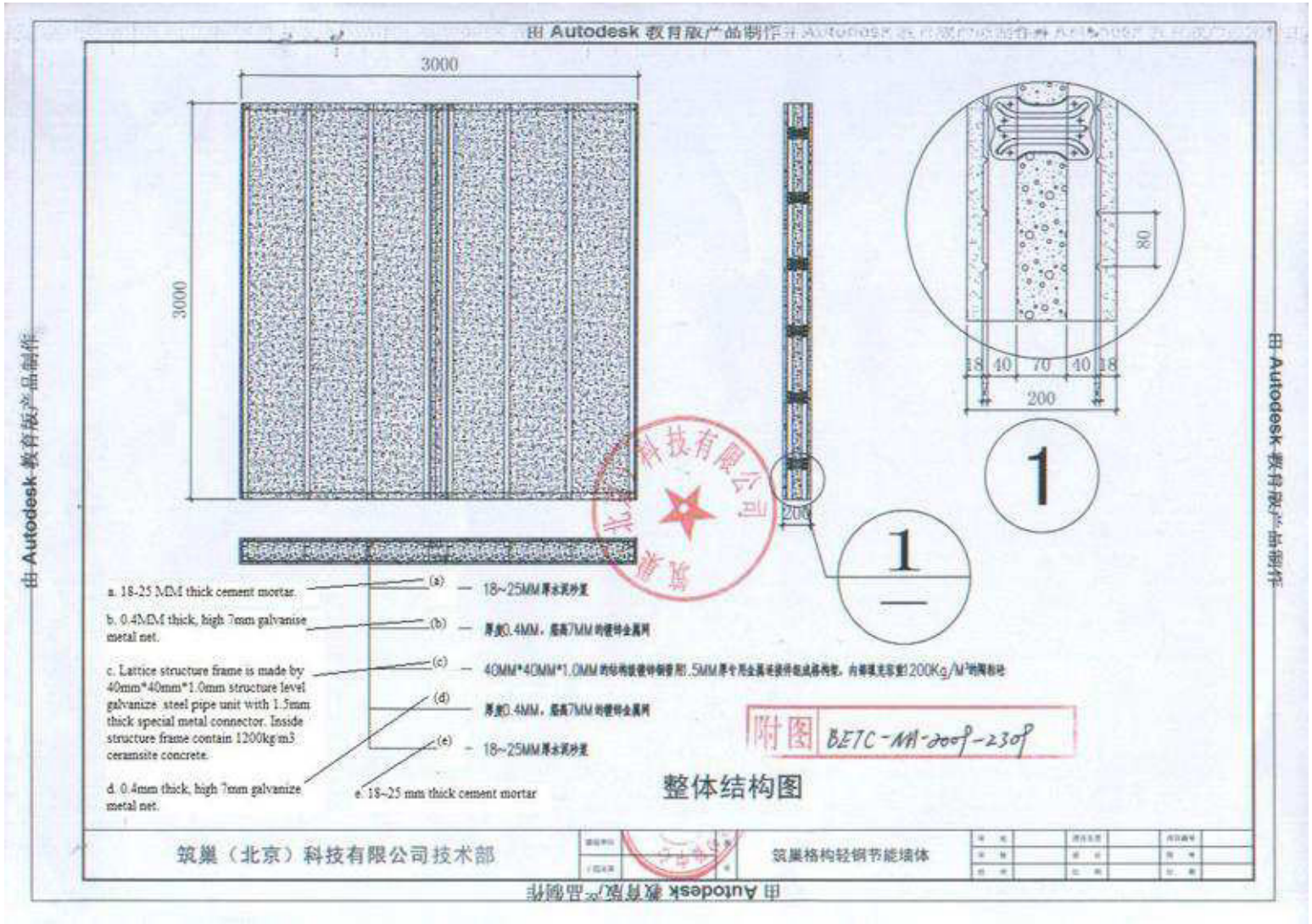
照片 2. 试验前试件背火面情况 Condition of surface unexposed to fire before testing.

检验数据及试件情况

照片 3. 试验 181min 时试件背火面情况（Condition of surface unexposed to fire when test start 181 min）.



照片 4. 试验后试件向火面情况（Condition of surface on the tire after testing）.


3000
3000
200
80
18
40
70
40
18
200
1
1
—
a. 18-25 MM thick cement mortar.
(a) — 18~25MM 厚水泥砂浆
b. 0.4MM thick, high 7mm galvanise metal net.
(b) — 厚度0.4MM，高度7MM 的镀锌金属网
c. Lattice structure frame is made by 40mm*40mm*1.0mm structure level galvanize steel pipe unit with 1.5mm thick special metal connector. Inside structure frame contain 1200kg/m3 ceramsite concrete.
(c) — 40MM*40MM*1.0MM 的轻钢镀锌钢管用1.5MM 厚专用金属连接件组成格构架，内填填充容重1200Kg/M³的陶粒砼
(d)
厚度0.4MM，高度7MM 的镀锌金属网
(e) — 18~25MM 厚水泥砂浆
d. 0.4mm thick, high 7mm galvanize metal net.
e. 18~25 mm thick cement mortar
附图 BETC-MH-2009-2309
整体结构图
筑巢（北京）科技有限公司技术部
筑巢格构轻钢节能墙体
由 Autodesk 教育版产品制作

WEBS

WIRA ECO BUILDING SYSTEMS

Lightweight Steel Structure Raw Material
- Energy Saving Wall Test

- **Tensile Strength**
- **Yield Strength**
- **Bend Test**
- **Elongation**
- **Mass of Galvanizing**

材料试验报告（通用） Test report of material（general）		编　　号（No.）	
		试验编号（No. of test）	2008-00010
		委托编号（No. of client）	
工程名称及部位（Name and position of engineering）		博洛尼工业园一期工程(boluoni)3#厂房	
委托单位 （Client）	筑巢（北京）科技有限公司	委托人 （Consignor）	徐翔 Xuxiang
材料名称及规格 （Name and standards）	热镀锌钢板,1.2 S350GD+Z (Heat-galvanized steel sheet)	试样编号 （No. of sample）	001
生产单位 （Manufacturer）	天津武钢(Tianjin wugang)	代表数量 （Representative quantity）	22t
试验依据 （Reference documents）	WJX（LZ）45-2004	来样日期 （Date of delivery）	2008-04-25

试验项目（Item）

抗拉强度（Tensile strength）
弯曲（Bend test）
断裂伸长率（Breaking percentage elongation）
镀锌层质量（Mass of galvanizing）

试验结果（Test result）

抗拉强度（Tensile strength）：屈服强度（Yield strength）485MPa ，抗拉强度（Tensile strength）580MPa
弯曲（Bend test）：合格（Qualified）
断裂伸长率（Breaking percentage elongation）：17%
镀锌层质量（Mass of galvanizing）：197g/m^2

结论（Conclusion）

依据 WJX（LZ）45-2004，所检测项目符合热镀锌钢板 S350+Z 技术要求。
According to WJX(LZ)45-2004,these tested items meet the criterion of heat-galvanized steel sheet S350+Z.

注意事项（NOTICE）

1. 报告无"检验鉴定章"或检验单位公章无效；
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批准(Approval)		审核 (Verification)		主检(Chief tester)	
检测试验单位 (Laboratory)	北京四环恒信建设工程检测有限公司 INFINITE CREDIT TEST OF BUILDING ENGINEERING LIMITED COMPANY				
报告日期(Date)	2008-04-30				

材料试验报告（通用）
Test report of material（general）

编　号（No.）			
试验编号（No. of test）		2008-00009	
委托编号（No. of client）			
工程名称及部位（Name and position of engineering）		博洛尼工业园一期工程(boluoni) 3#厂房	
委托单位（Client）	筑巢（北京）科技有限公司	委托人（Consignor）	徐翔 Xuxiang
材料名称及规格（Name and standards）	热镀锌钢板,1.5 S350GD+Z (Heat-galvanized steel sheet)	试样编号（No. of sample）	001
生产单位（Manufacturer）	天津武钢(Tianjin wugang)	代表数量（Representative quantity）	50t
试验依据（Reference documents）	WJX（LZ）45-2004	来样日期（Date of delivery）	2008-04-25

试验项目（Item）

抗拉强度（Tensile strength）
弯曲（Bend test）
断裂伸长率（Breaking percentage elongation）
镀锌层质量（Mass of galvanizing）

试验结果（Test result）

抗拉强度（Tensile strength）：屈服强度（Yield strength）370MPa ，抗拉强度（Tensile strength）425MPa
弯曲（Bend test）：合格（Qualified）
断裂伸长率（Breaking percentage elongation）：21%
镀锌层质量（Mass of galvanizing）：207g/m^2

结论（Conclusion）

依据 WJX（LZ）45-2004，所检测项目符合热镀锌钢板 S350+Z 技术要求。
According to WJX(LZ)45-2004,these tested items meet the criterion of heat-galvanized steel sheet S350+Z.

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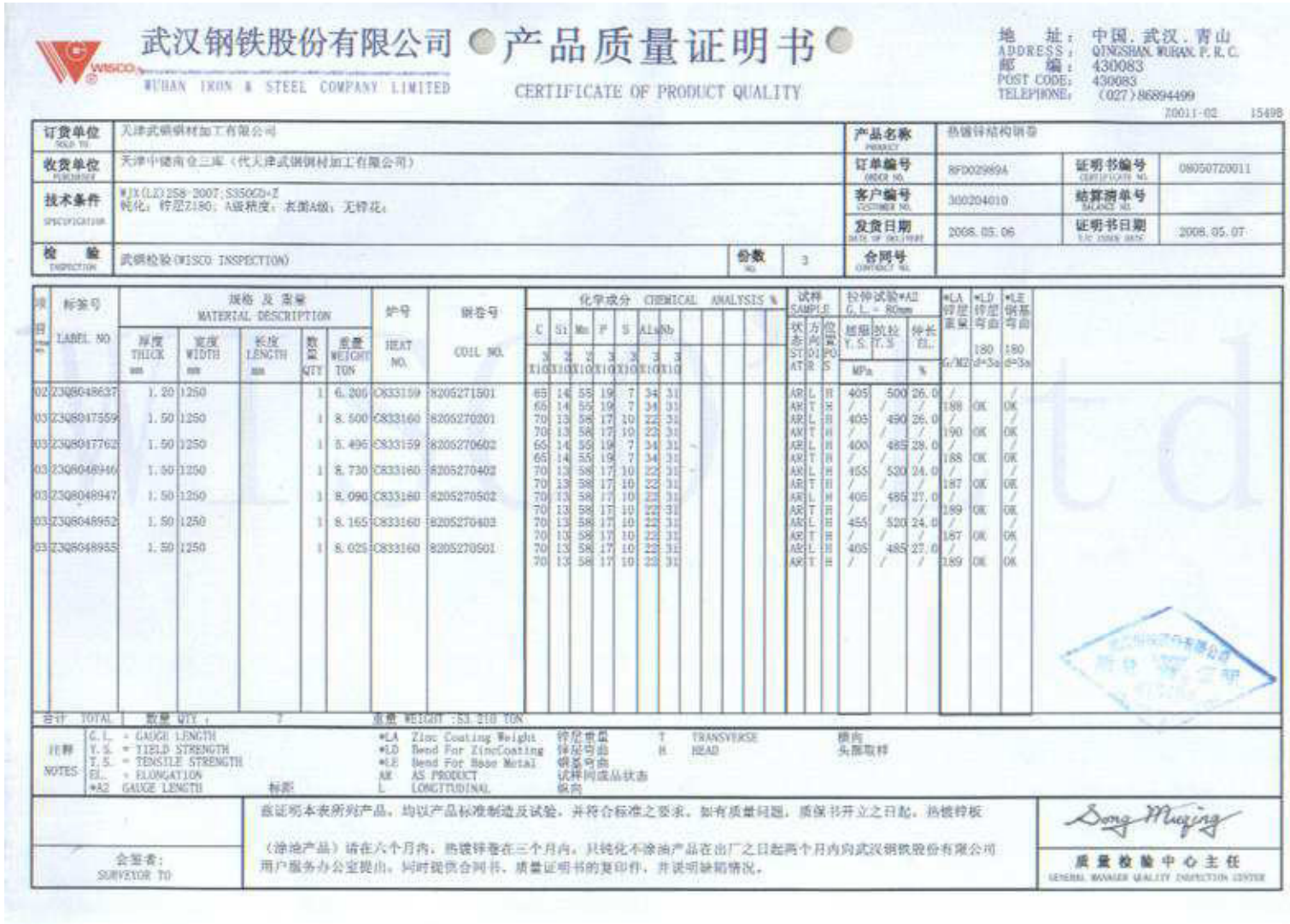
2. 复制报告未重新加盖"检验鉴定章"或检验单位公章无效；
   Duplication of testreport is invalid without the "Stamp of testreport" or that of test department re-stamped on it.
3. 报告无主检、审核、批准签字无效；
   Test report is invalid without the signatures of the persons for chief test, verification and approval.
4. 报告涂改无效；
   Test report is invalid if altered.
5. 对检验报告若有异议，应于收到报告之日起十五日内向检验单位提出；
   Different opinions about test report should be reported to the test department within 15 days from the date of receiving the test report.
6. 一般情况，委托检验仅对来样负责。
   In general, for entrusted tests the responsibilities are undertaken for the delivered samples only.

批准(Approval)		审核（Verification）		主检(Chief tester)	
检测试验单位（Laboratory）	北京四环恒信建设工程检测有限公司 INFINITE CREDIT TEST OF BUILDING ENGINEERING LIMITED COMPANY				
报告日期(Date)	2008-04-30				



武汉钢铁股份有限公司 产品质量证明书

WUHAN IRON & STEEL COMPANY LIMITED　CERTIFICATE OF PRODUCT QUALITY

地　址：中国．武汉．青山
ADDRESS：QINGSHAN, WUHAN, P. R. C.
邮　编：430083
POST CODE：430083
TELEPHONE：（027）86894499

70011-02　15498

订货单位 SOLD TO	天津武钢钢材加工有限公司		产品名称 PRODUCT	热镀锌结构钢带	
收货单位 PURCHASER	天津中建南仓三库（代天津武钢钢材加工有限公司）		订单编号 ORDER NO.	RFD029689A	证明书编号 CERTIFICATE NO. 08050720011
技术条件 SPECIFICATION	YJX(LZ)2S8-2007;S350GD+Z 钝化；锌层Z180；A级精度；表面A级；无锌花；		客户编号 CUSTOMER NO.	300204010	结算清单号 BALANCE NO.
			发货日期 DATE OF DELIVERY	2008.05.06	证明书日期 DATE ISSUED 2008.05.07
检　验 INSPECTION	武钢检验(WISCO INSPECTION)	份数 NO. 3	合同号 CONTRACT NO.		

项目 ITEM	标签号 LABEL NO	规格及质量 MATERIAL DESCRIPTION 厚度 THICK mm	宽度 WIDTH mm	长度 LENGTH mm	数量 QTY	重量 WEIGHT TON	炉号 HEAT NO.	钢卷号 COIL NO.	化学成分 CHEMICAL ANALYSIS % C	Si	Mn	P	S	Al	Nb	试样 SAMPLE 状态 STD AT	方向 DIR	位置 POS	拉伸试验*A2 G.L. = 80mm 屈服 Y.S. MPa	抗拉 T.S. MPa	伸长 El. %	*LA 锌层重量 g/M2	*LD 锌层弯曲 180 d=3a	*LE 钢基弯曲 180 d=3a
02	Z3Q8048637	1.20	1250		1	6.206	C833159	8205271501	65	14	55	19	7	34	31	AR	L	H	405	500	26.0	/	/	/
									66	14	55	19	7	34	31	AR	T	H	/	/	/	188	OK	OK
03	Z3Q8047559	1.50	1250		1	8.500	C833160	8205270201	70	13	58	17	10	22	31	AR	L	H	405	490	26.0	/	/	/
									70	13	58	17	10	22	31	AR	T	H	/	/	/	190	OK	OK
03	Z3Q8047762	1.50	1250		1	5.496	C833159	8205270602	65	14	55	19	7	34	31	AR	L	H	400	485	28.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	188	OK	OK
03	Z3Q8048946	1.50	1250		1	8.730	C833160	8205270402	70	13	58	17	10	22	31	AR	L	H	455	520	24.0	/	/	/
									70	13	58	17	10	22	31	AR	T	H	/	/	/	187	OK	OK
03	Z3Q8048947	1.50	1250		1	8.090	C833160	8205270502	70	13	58	17	10	22	31	AR	L	H	405	485	27.0	/	/	/
									70	13	58	17	10	22	31	AR	T	H	/	/	/	189	OK	OK
03	Z3Q8048952	1.50	1250		1	8.165	C833160	8205270403	70	13	58	17	10	22	31	AR	L	H	455	520	24.0	/	/	/
									70	13	58	17	10	22	31	AR	T	H	/	/	/	187	OK	OK
03	Z3Q8048955	1.50	1250		1	8.025	C833160	8205270501	70	13	58	17	10	22	31	AR	L	H	405	485	27.0	/	/	/
									70	13	58	17	10	22	31	AR	T	H	/	/	/	189	OK	OK

合计 TOTAL　数量 QTY：7　重量 WEIGHT：53.210 TON

注释 NOTES:
G. L. = GAUGE LENGTH
Y. S. = YIELD STRENGTH
T. S. = TENSILE STRENGTH
El. = ELONGATION
*A2 GAUGE LENGTH 标距
*LA Zinc Coating Weight 锌层重量
*LD Bend For ZincCoating 锌层弯曲
*LE Bend For Base Metal 钢基弯曲
AR AS PRODUCT 试样同成品状态
L LONGITUDINAL 纵向
T TRANSVERSE 横向
H HEAD 头部取样

会签者：
SURVEYOR TO

兹证明本表所列产品，均以产品标准制造及试验，并符合标准之要求。如有质量问题，质保书开立之日起，热镀锌板

（涂油产品）请在六个月内，热镀锌卷在三个月内，只钝化不涂油产品在出厂之日起两个月内向武汉钢铁股份有限公司用户服务办公室提出，同时提供合同书、质量证明书的复印件，并说明缺陷情况。

Dong Muqing

质量检验中心主任
GENERAL MANAGER QUALITY INSPECTION CENTER

武汉钢铁股份有限公司 产品质量证明书

WUHAN IRON & STEEL COMPANY LIMITED　CERTIFICATE OF PRODUCT QUALITY

地　址：中国．武汉．青山
ADDRESS：QINGSHAN, WUHAN, P.R.C.
邮　编：430083
POST CODE：430083
TELEPHONE：(027)86894499

Z0003-02　14068

订货单位	天津武钢钢材加工有限公司	产品名称	热镀锌结构钢卷		
收货单位	天津中储南仓三库（代天津武钢钢材加工有限公司）	订单编号	8FD029894	证明书编号	08050620003
技术条件	WTE(LZ)258-2007:S350GD+Z 钝化：背层Z180；A级精度；表面A级；无锌花；	客户编号	300204010	结算清单号	
		发货日期	2008.05.05	证明书日期	2008.05.06
检　验	武钢检验(WISCO INSPECTION)　份数 3	合同号			

项目	标签号	规格及重量 MATERIAL DESCRIPTION 厚度	宽度	长度	数量	重量	炉号	钢卷号	化学成分 CHEMICAL ANALYSIS % C	Si	Mn	P	S	Al	Nb	试样 SAMPLE 状态	方向	位置	拉伸试验*A2 G.L.=80mm 屈服 Y.S.	抗拉 T.S.	伸长 EL.	*LA 锌层重量	*LD 锌层弯曲	*LE 钢基弯曲
	LABEL NO	THICK mm	WIDTH mm	LENGTH mm	QTY	WEIGHT TON	HEAT NO.	COIL NO.	% X100	% X100	% X100	% X100	% X100	% X100	% X10	STATE	DIR.	POS.	MPa		%	G/M2	180 d=3a	180 d=3a
02	Z3Q8047759	1.20	1250		1	6.120	C833159	8205271601	65	14	55	19	7	34	31	AR	L	H	400	485	27.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	185	OK	OK
02	Z3Q8047918	1.20	1250		1	6.170	C833159	8205271603	65	14	55	19	7	34	31	AR	L	H	395	485	27.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	185	OK	OK
03	Z3Q8047131	1.50	1250		1	6.280	C833159	8205270703	65	14	55	19	7	34	31	AR	L	H	400	485	27.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	190	OK	OK
03	Z3Q8047132	1.50	1250		1	6.215	C833159	8205270801	65	14	55	19	7	34	31	AR	L	H	400	485	27.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	185	OK	OK
03	Z3Q8047134	1.50	1250		1	6.510	C833159	8205270804	65	14	55	19	7	34	31	AR	L	H	400	485	27.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	185	OK	OK
03	Z3Q8047193	1.50	1250		1	6.463	C833159	8205270702	65	14	55	19	7	34	31	AR	L	H	400	485	27.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	190	OK	OK
03	Z3Q8047194	1.50	1250		1	6.119	C833159	8205270704	65	14	55	19	7	34	31	AR	L	H	400	480	27.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	190	OK	OK
03	Z3Q8047331	1.50	1250		1	6.280	C833160	8205269701	70	12	58	17	10	22	31	AR	L	H	400	485	28.0	/	/	/
									70	12	58	17	10	22	31	AR	T	H	/	/	/	184	OK	OK
03	Z3Q8047395	1.50	1250		1	5.535	C833159	8205270603	65	14	55	19	7	34	31	AR	L	H	400	485	28.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	188	OK	OK
03	Z3Q8047396	1.50	1250		1	6.350	C833159	8205270802	65	14	55	19	7	34	31	AR	L	H	400	485	27.0	/	/	/
									65	14	55	19	7	34	31	AR	T	H	/	/	/	185	OK	OK

合计 TOTAL　数量 QTY：10　　质量 WEIGHT：62.035 TON

武汉钢铁股份有限公司 质量证明 WISCO

注解 NOTES

G.L. = GAUGE LENGTH		*LA Zinc Coating Weight	锌层重量	T TRANSVERSE	横向
Y.S. = YIELD STRENGTH		*LD Bend For ZincCoating	锌层弯曲	H HEAD	头部取样
T.S. = TENSILE STRENGTH		*LE Bend For Base Metal	钢基弯曲		
EL. = ELONGATION		AR AS PRODUCT	试样为成品状态		
*A2 GAUGE LENGTH	标距	L LONGITUDINAL	纵向		

会签者：
SURVEYOR TO

盖证明本表所列产品，均以产品标准制造及试验，并符合标准之要求。如有质量问题，质保书开立之日起，热镀锌板

（除油产品）请在六个月内，热镀锌卷在三个月内，钝化不涂油产品在出厂之日起两个月内向武汉钢铁股份有限公司用户服务办公室提出，同时提供合同书、质量证明书的复印件，并说明缺陷情况。

Song Muqing

质量检验中心主任
GENERAL MANAGER QUALITY INSPECTION CENTER

合同号 [illegible]
CONTRACT NO.

邯 郸 钢 铁 集 团 有 限 公 司
HANDAN IRON AND STEEL GROUP COMPANY LTD.

证书编号 [illegible]
CERTIFICATE NO.
日期 [illegible]
DATE

[illegible]
PURCHASER

冷轧镀锌钢带质量证明书

GALVANIZED STRIP QUALITY CERTIFICATE

到站
DESTINATION

车号 [illegible]
VEHICLE

出库单号 [illegible]
DISPATCH BILL OF STOREHOUSE

技术标准 EN 10326-2004
TECHNICAL STANDARD

钢种 钢级 STEEL GRADE	镀锌卷号 GALVANIZED COIL NO.	上级卷号 INCOMING MATERIAL COIL NO.	规格 DIMENSIONS mm	数量 QUANTITY 件 PIECES	净重 NET WEIGHT 吨 TONS	化学成分 CHEMICAL COMPOSITION C	Mn	Si	P	S	屈服 Z.P.	抗拉 T.S.	伸长率 E.L.	冷弯 B.T.	锌层级别 ZINC LAYER GRADE	冷弯 COLD BENDING	表面结构 SURFACE STRUCTURE	表面处理 SURFACE TREATMENT	压延缺陷 DEFECT
S350GD+Z	一级 [illegible]	[illegible]	1.0×[illegible]0.830	1	11.520	0.19	0.32	0.36	0.013	0.005	400	460	28	完好	Z18	完好	[illegible]	[illegible]	–
S350GD+Z	一级 [illegible]	[illegible]	1.0×[illegible]0.830	1	5.580	0.19	0.32	0.34	0.013	0.005	400	460	28	完好	Z180	完好	[illegible]	[illegible]	–

[illegible]
SIGNATURE IN CHARGE OF QUALITY INSPECTION OF HANDAN

17.100

交货状态：冷轧镀锌
CONDITION OF DELIVERY

备注：
REMARK

[illegible]经检验，符合规定的技术标准。WE PROVE THAT THE MATERIAL HAS PASSED THE EXAMINATION AND MEET THE TECHNICAL STANDARD. 钢号及厚度以本证书为准，复印、手写、涂改、无印章均无效。THE STEEL TYPE AND THICKNESS ACCORDING TO THE QUALITY CERTIFICATE. THE COPY, HANDWRITING AND REWRITING TO THE CERTIFICATE IS INVALID.

包装代码 (PACKING CODE)：[illegible]
[illegible]自开证之日2个月 [illegible] 质保期自开证之日起3个月

审核 [illegible]
EXAMINANT
发货 [illegible]
CONSIGNOR
开证 [illegible]
TABULATOR

地址：中国 河北 邯郸
ADD: CHINA HEBEI HANDAN
电话：(0310) [illegible]
TEL
传真：0310-[illegible]
FAX

合同号:0900070901
CONTRACT NO

邯 钢 集 团 有 限 公 司
HANDAN IRON AND STEEL GROUP COMPANY LTD

证书编号: 0808211643l
CERTIFICATE NO

订货单位: 河北聚丰钢铁贸易有限公司
PURCHASER

冷轧镀锌钢带质量证明书

GALVANIZED STRIP QUALITY CERTIFICATE

日期: 20080926
DATE

到站:
DESTINATION

车号: 25800
VEHICLE

出库单号: SP200809250004
DISPATCH BILL OF STOREHOUSE

技术标准: EN 10326:2004
TECHNICAL STANDARD

钢种等级 STEEL GRADE	镀锌批号 GALVANIZED COIL NO	上级批号 INCOMING MATERIAL COIL NO	规格 DIMENSIONS mm	数量 QUANTITY 件 PIECES	净重 NET WEIGHT 吨 TONS	化学成分% CHEMICAL COMPOSITION C	Mn	Si	P	S	屈服度 Y.P δs	抗拉强度 T.S δb	伸长率 E.L δ5	冷弯 B.T	锌层 ZINC LAYER 锌层级别 ZINC LAYER GRADE	冷弯 COLD BENDING	表面结构 SURFACE STRUCTURES	表面处理 SURFACE TREATMENT	主要缺陷原因
S350GD+Z 一级	020034D18		1480*0.800	1	13.610	0.19	0.32	0.06	0.013	0.005	420	470	28	完好	Z180	完好	RS	CO	-
S350GD+Z 一级	019991D18		1480*1.500	1	13.540	0.19	0.33	0.04	0.017	0.007	380	475	35	完好	Z180	完好	RS	CO	-
S350GD+Z 一级	020003D18		1480*1.600	1	13.540	0.19	0.32	0.05	0.015	0.005	350	460	28	完好	Z180	完好	RS	CO	-
S350GD+Z 一级	019992D18		1480*1.500	1	12.840	0.19	0.33	0.04	0.017	0.007	380	475	35	完好	Z18	完好	RS	CO	-
S350GD+Z 一级	020004D18		1480*1.500	1	12.540	0.19	0.32	0.05	0.015	0.005	350	460	28	完好	Z180	完好	RS	CO	-
S350GD+Z 一级	020044D18		1480*0.800	1	13.550	0.18	0.31	0.04	0.012	0.005	400	460	28	完好	Z180	完好	RS	CO	-
S350GD+Z 一级	020045D18		1480*0.800	1	12.810	0.18	0.31	0.04	0.012	0.005	400	460	28	完好	Z180	完好	RS	CO	-

制造厂质量检验负责人: 王宇
CENTRALL IN CHARGE OF EXAMINATION OF MANUFACTORY

合计: TOTAL 7 92.430

交货状态: 冷轧镀锌
CONDITION OF DELIVERY

备注:
REMARKS

兹证明此材料经检验,符合规定的技术标准。 WE PROVE THAT THE MATERIAL HAVE PASSED THE EXAMINATION AND MEET THE TECHNICAL STANDARD 钢号及厚度以本证明为准,复印、手写、改写、无印章均无效。THE REAL STEEL TYPE AND THICKNESS ACCORDING TO THE QUALITY CERTIFICATETHE COPY HANDWRITING AND REWRITING TO THE CERTIFICATE IS INVALID

包装代码 (PACKING CODE): 卧式精包装 (钢板)
只钝化处理抗氧化质保期自开证之日 2 个月,钝化+涂油抗氧化质保期自开证之日起3个月

审核: 田维成
EXAMINANT

发货: 杨强
CONSIGNOR

开证: 倪建宁
TABULATOR

地址: 中国 河北 邯郸
ADD: CHINA HEBEI HANDAN

电话: (0310) 6078769
TEL:

传真: 0310-6078231
FAX:

WEBS

WIRA ECO BUILDING SYSTEMS

Connection -Screw Test-Cross Recessed Pan Head

- **Shear Failure Force**
- **Failure Moment of Torsion**
- **Mass**
- **Mass of Galvanizing**

材料试验报告（通用）
Test report of material（general）

编　号（No.）			
试验编号（No. of test）			2008-00004
委托编号（No. of client）			
工程名称及部位（Name and position of engineering）		博洛尼工业园一期工程(boluoni)1＃厂房	
委托单位（Client）	筑巢（北京）科技有限公司	委托人（Consignor）	徐翔 Xuxiang
材料名称及规格（Name and standards）	十字槽盘头自钻自攻螺钉 Cross recessed pan head drilling screws with tapping screw thread	试样编号（No. of sample）	003
生产单位（Manufacturer）	慈溪市振成机械有限公司 Cixi zhencheng	代表数量（Representative quantity）	32 万颗
试验依据（Reference documents）	GB/T3098.11-2002 GB/T2973-2004	来样日期（Date of delivery）	2008-03-10

试验项目（Item）

剪切破坏力（Shear failure force），破坏扭矩（Failure moment of torsion）
螺钉质量（mass），镀锌层质量（Mass of galvanizing）

试验结果（Test result）

编号（No.）	1	2	3	4	5	平均值(Mean)
剪切破坏力（Shear failure force）	5.204kN	5.118kN	5.003kN	4.997kN	5.111kN	5.087kN
破坏扭矩（Failure moment of torsion）	4.97N.m	4.81N.m	4.88N.m	4.91N.m	4.84N.m	4.88N.m
螺钉质量（Mass）	1.6358g	1.6336g	1.6982g	1.6447g	1.6275g	1.6480g
镀锌层质量（Mass of galvanizing）	0.0128g	0.0125g	0.0120g	0.0137g	0.0131g	0.0128g

注意事项（NOTICE）

1. 报告无"检验鉴定章"或检验单位公章无效；
   Test report is invalid without the "Stamp of test report" or that of test department on it.
2. 复制报告未重新加盖"检验鉴定章"或检验单位公章无效；
   Duplication of testreport is invalid without the "Stamp of testreport" or that of test department re-stamped on it.
3. 报告无主检，审核，批准签字无效；
   Test report is invalid without the signatures of the persons for chief test，verification and approval.
4. 报告涂改无效；
   Test report is invalid if altered.
5. 对检验报告若有异议，应于收到报告之日起十五日内向检验单位提出；
   Different opinions about test report should be reported to the test department within 15 days from the date of receiving the test report.
6. 一般情况，委托检验仅对来样负责。
   In general，for entrusted tests the responsibilities are undertaken for the delivered samples only.

批准(Approval)		审核(Verification)		主检(Chief tester)	
检测试验单位（Laboratory）	北京四环恒信建设工程检测有限公司 INFINITE CREDIT TEST OF BUILDING ENGINEERING LIMITED COMPANY				
报告日期(Date)	2008-03-15				

慈溪市振成机械有限公司

CIXI CITY ZHENCHENG MACHINERY CO., LTD

品质证明书

客户名称：　　材质：SWRCH22A　　NO：009062201

标准值 / 品名	规格	表面处理		芯部硬度	表面硬度	渗碳层 mm	钻孔性能 螺纹底孔直径 mm	破坏力矩 N.m	拧入性能 （拧入时间 s）	备注
	ST4.8	光泽度	均匀度	320~400 HV_{10}	≥530 $HV_{0.3}$	0.10~0.23	3.2~3.6	≥4.7	≤5	
十字盘头华司自钻自钻螺钉	16	良	良	387	580	0.137	3.55	7.8	3.15	

说明：本品制造标准 GB/T15856.1~GB/T15856.4，机械性能检测 GB/T3098.11-2002，外贸<DIN>。

品质主管：王爱泗

慈溪市振成机械有限公司 技术部

2009 年 6 月 22 日

WEBS

WIRA ECO BUILDING SYSTEMS

Connection -Screw Test-Hexagon Flange Head

- **Shear Failure Force**
- **Failure Moment of Torsion**
- **Mass**
- **Mass of Galvanizing**

材料试验报告（通用）
Test report of material（general）

编　　号（No.）			
试验编号（No. of test）			2007-00002
委托编号（No. of client）			
工程名称及部位（Name and position of engineering）		博洛尼工业园一期工程(boluoni)1＃厂房	
委托单位（Client）	筑巢（北京）科技有限公司	委托人（Consignor）	徐翔 Xuxiang
材料名称及规格（Name and standards）	六角法兰自钻自攻螺钉（黄色）Hexagon flange head drilling screws with tapping screw thread	试样编号（No. of sample）	001
生产单位（Manufacturer）	慈溪市振成机械有限公司 Cixi zhencheng	代表数量（Representative quantity）	7000 颗
试验依据（Reference documents）	GB/T3098.11-2002	来样日期（Date of delivery）	2007-12-01

试验项目（Item）

剪切破坏力（Shear failure force），破坏扭矩（Failure moment of torsion）
螺钉质量（mass），镀锌层质量（Mass of galvanizing）

试验结果（Test result）

编号（No.）	1	2	3	4	5	平均值(Mean)
剪切破坏力（Shear failure force）	8.440kN	8.645kN	8.560kN	8.240kN	8.595kN	8.496kN
破坏扭矩（Failure moment of torsion）	7.31N.m	7.75N.m	7.45N.m	7.56N.m	7.92N.m	7.60N.m
螺钉质量（Mass）	/	/	/	/	/	/
镀锌层质量（Mass of galvanizing）	/	/	/	/	/	/

注意事项（NOTICE）

1. 报告无"检验鉴定章"或检验单位公章无效；
   Test report is invalid without the "Stamp of test report" or that of test department on it.
2. 复制报告未重新加盖"检验鉴定章"或检验单位公章无效；
   Duplication of testreport is invalid without the "Stamp of testreport" or that of test department re-stamped on it.
3. 报告无主检、审核、批准签字无效；
   Test report is invalid without the signatures of the persons for chief test, verification and approval.
4. 报告涂改无效；
   Test report is invalid if altered.
5. 对检验报告若有异议，应于收到报告之日起十五日内向检验单位提出；
   Different opinions about test report should be reported to the test department within 15 days from the date of receiving the test report.
6. 一般情况，委托检验仅对来样负责。
   In general, for entrusted tests the responsibilities are undertaken for the delivered samples only.

批准(Approval)		审核(Verification)		主检(Chief tester)	
检测试验单位（Laboratory）	北京四环恒信建设工程检测有限公司 INFINITE CREDIT TEST OF BUILDING ENGINEERING LIMITED COMPANY				
报告日期(Date)	2007-12-06				

材料试验报告（通用）
Test report of material（general）

		编　号（No.）	
		试验编号（No. of test）	2008-00003
		委托编号（No. of client）	
工程名称及部位（Name and position of engineering）		博洛尼工业园一期工程(boluoni)1＃厂房	
委托单位（Client）	筑巢（北京）科技有限公司	委托人（Consignor）	徐翔 Xuxiang
材料名称及规格（Name and standards）	六角法兰自钻自攻螺钉（银色）Hexagon flange head drilling screws with tapping screw thread	试样编号（No. of sample）	002
生产单位（Manufacturer）	慈溪市振成机械有限公司 Cixi zhencheng	代表数量（Representative quantity）	8000 颗
试验依据（Reference documents）	GB/T3098.11-2002 GB/T2793-2004	来样日期（Date of delivery）	2008-01-08

试验项目（Item）

剪切破坏力（Shear failure force），破坏扭矩（Failure moment of torsion）
螺钉质量（mass），镀锌层质量（Mass of galvanizing）

试验结果（Test result）

编号（No.）	1	2	3	4	5	平均值(Mean)
剪切破坏力（Shear failure force）	7.100kN	6.921kN	6.887kN	6.994kN	7.028kN	6.986kN
破坏扭矩（Failure moment of torsion）	5.38N.m	5.51N.m	5.57N.m	5.49N.m	5.63N.m	5.52N.m
螺钉质量（Mass）	3.0071g	3.0281g	3.1002g	3.0121g	3.0428g	3.0381g
镀锌层质量（Mass of galvanizing）	0.0132g	0.0124g	0.0137g	0.0159g	0.0167g	0.0144g

注意事项（NOTICE）

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批准(Approval)		审核(Verification)		主检(Chief tester)	
检测试验单位（Laboratory）	北京四环恒信建设工程检测有限公司 INFINITE CREDIT TEST OF BUILDING ENGINEERING LIMITED COMPANY				
报告日期(Date)	2008-01-13				

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