

# Spray Polyurea Elastomer Technology Used in Infrastructure's Construction in CHINA



2019 POLYUREA DEVELOPMENT ASSOCIATION  
**ANNUAL CONFERENCE**  
HILTON ORANGE COUNTY/COSTA MESA HOTEL

**Weibo Huang**

**Qingdao University  
of Technology**

**Qingdao, CHINA**

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- 1. Biography**
- 2. Cooperated with PDA Since 2002**
- 3. Edited the 1<sup>st</sup> Monograph on Polyurea**
- 4. Promoted Polyurea Worldwide**
- 5. Focused on China Infrastructure's Construction**
- 6. PDA and Polyurea**
- 7. Latest R & D**



# Biography



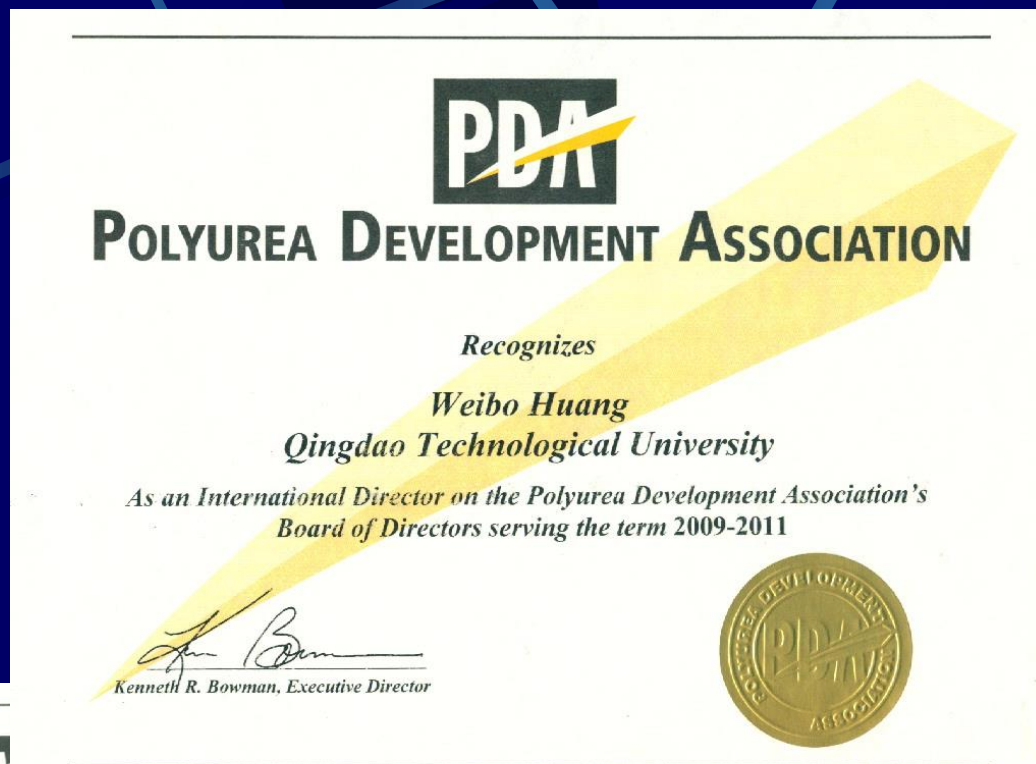
- **Born in Aug. 8, 1963**
- **Ph. D, Professor**
- **Began on Polyurea in 1995**
- **Joined PDA in 2002**
- **Edited the monograph on polyurea in 2005**
- **Confirmed the 1<sup>st</sup> book on polyurea in the 7th PDA Annual Conference, 2006**
- **More than 220 papers, 36 patent rights and 6 books were published**
- **China Outstanding Coating Experts in 2009**

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# 3 Times International Director of PDA



*Recognizes*  
**Weibo Huang**  
*With*  
**Marine Chemical Research Institute**  
*As an*  
**International Director of the PDA Board**  
2002-2004

*Kenneth R. Bowman*  
Kenneth R. Bowman, Executive Director



PDA Member Since December 31, 2002



*Recognizes*  
**Dr. Weibo Huang**  
*Marine Chemical Research Institute*  
*As a*  
**International Director of the**  
**Polyurea Development Association Board of Directors**  
2003 - 2005

*Kenneth R. Bowman*  
Kenneth R. Bowman, Executive Director



*Bruce Hall*  
Bruce Hall, President

# PDA Board of Directors 2002~2005



# PDA Board of Directors 2009~2011



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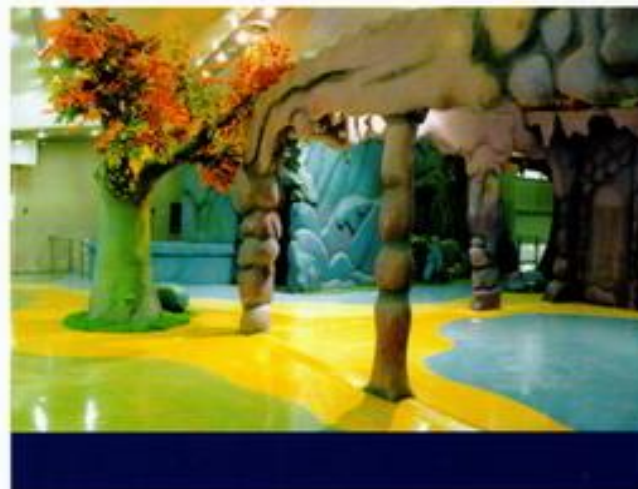


黄微波 主编

# 喷涂聚脲弹性体技术

Published in  
2005

Revised in 2020



Chemical Industry Press

化学工业出版社  
材料科学与工程出版中心



# The Releasing Ceremony in 2005



# The 1<sup>st</sup> Monograph on Polyurea Confirmed by PDA in 2006

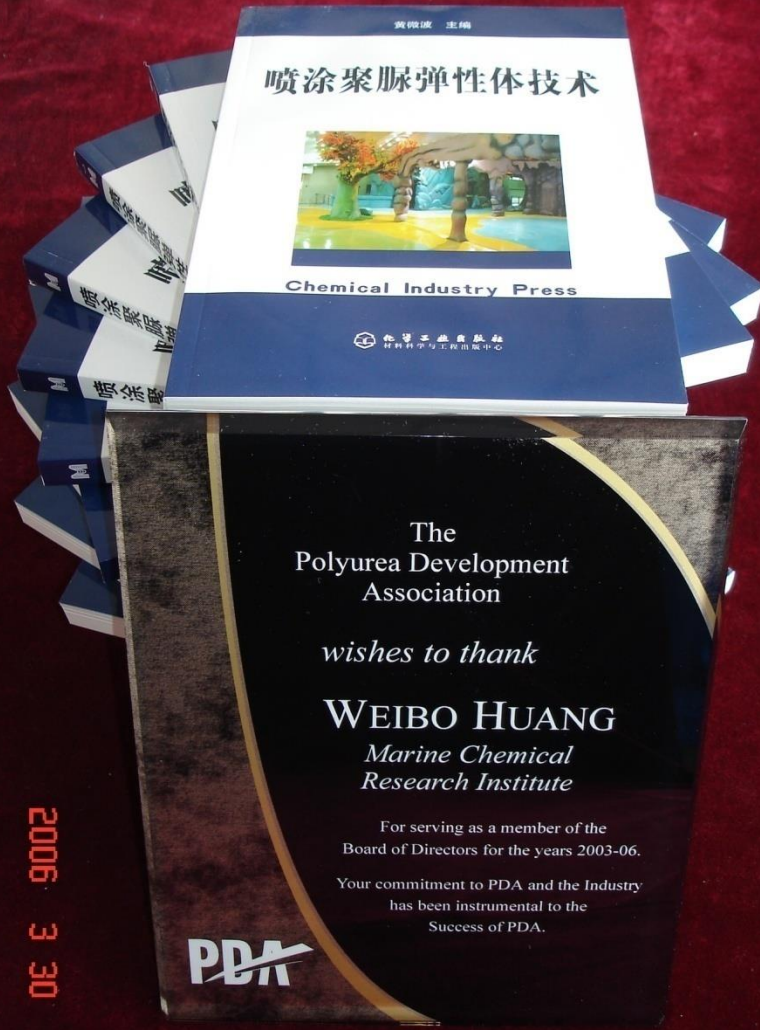
## 喷涂聚脲弹性体技术

黄微波 主编

*David Noel* *Ken Berman*  
*John Schmitt* *Charles Bond*  
*David J. Rainey* *John Tannover*  
*Lee Berman* *Mark White*  
*David Beech* *Gregory*  
*Jeff Dawson* *Paul*  
*Wendell* *Yongmanos*  
*Sean Boyer* *Eugene Lee*  
*Lee Hanan* *Leon Spate HTS CANADA*  
*Lon Lon* *John Meile GLASTONBURY ITALY*  
*P. Zam* *John Leon*  
*Murph McHaffey* *Christiane Hache*  
*Courtney Sussel* *CBST Corp.*  
 化学工业出版社  
 材料科学与工程出版中心  
 北京  
 Thanks!  
 See you in  
 Shanghai  
 Sherlock



# The 1<sup>st</sup> Monograph on Polyurea Confirmed by PDA in 2006







2009年中国聚脲发展协会（PDA-CHINA）工作会议合影留念





### WELCOME TO PDA

The Polyurea Development Association (PDA) is the trade association for the global polyurea industry and is dedicated specifically to the polyurea technology. PDA provides resources, education, support and a global network to the polyurea industry through volunteers from leading companies involved in all aspects of polyurea. It is the mission of PDA to promote market awareness, understanding and acceptance of polyurea technology through the development of education programs, product standards, safety and environmental and use recommendations. [more info](#)

#### Featured Member:

[Beijing Oriental Yuhong Waterproof Technology Co.Ltd.](#)

#### Find a Contractor:

[contractor who successfully completed a PDA Contractor Spray Course](#)

#### Upcoming Events:

PDA Webinar, "Light Stable Polyaspartic Coatings for Construction Applications – Chemistry, Attributes, Uses and Case History"  
Date: 11/3/2009

[More Info](#)

PDA 2010 Annual Conference  
Date: 4/13/2010

[More Info](#)

[View All](#)

Association  
City MO 64106  
one  
ax

Twitter

#### Alliances:



Polyurea Development Association China



Polyurea Development Association Europe

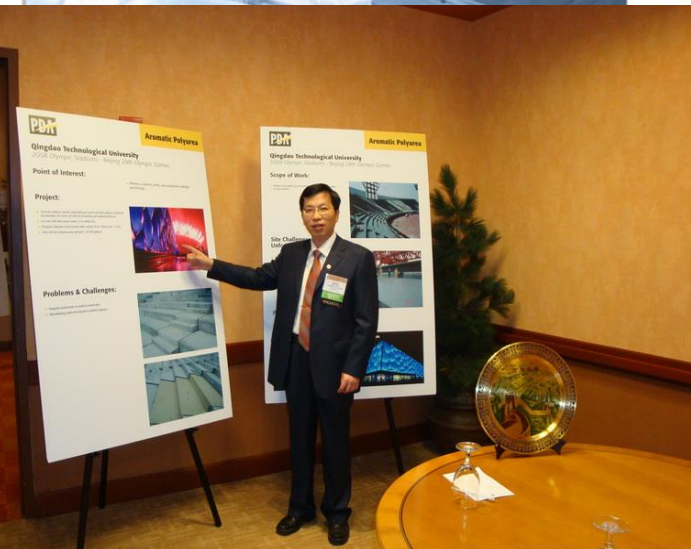


de aminas. Las resinas de poliurea no tendrán ninguna molécula intencional de hidróxido. Cualquier hidróxido será el resultado de una conversión incompleta hacia una resina amino terminada. La mezcla de resinas tendrá además en su contenido, aditivos o componentes no primarios. Estos aditivos pueden contener hidróxido, así como pigmentos pre-dispersos en un vehículo de poliol. Normalmente la mezcla de resinas no tendrá catalizadores.

PDA 使命宣言:  
 美国聚氨酯协会 (PDA) 的使命是促进市场发展, 通过发展教育项目, 产品标准, 安全环保与环境保护以及使用建议, 提高施工技术得到广泛接受。  
 PDA 工作章程  
 明确定义美国产品  
 建立美国聚氨酯行业项目并在全球范围内推广  
 作为美国聚氨酯行业的交流平台  
 建立美国施工标准和规范  
 建立美国聚氨酯行业教育项目的框架  
 组织和举办行业展览会, 为技术讲座, 新产品发布, 技术咨询及为行业的建立提供平台  
 谁可以成为 PDA 的成员?  
 聚氨酯行业的所有以下人员:  
 承包商  
 承包商协会  
 原料供应商  
 经销商  
 高级管理人员/物主  
 设备制造商  
 聚氨酯施工商  
 聚氨酯产品制造商  
 聚氨酯行业代理商  
 原料生产商  
 行业工程师  
 聚氨酯施工商  
 环境相关企业  
 施工材料商

美国聚氨酯协会 (PDA) 为您提供机会, 让您在定期的发展应用, 技术, 营销以及教育的发展项目。

会员从以下渠道中受益:  
 • 销售机会  
 • 参加行业展览会  
 • 行业博览会交流平台  
 • 国际技术文章, 最新研究报告  
 • 《聚氨酯杂志》链接  
 • PDA 杂志网站  
 • PDA 博客  
 • 会员网络论坛  
 • PDA 论坛  
 • 如果您从事与聚氨酯技术及相关材料的应用, 原料制造, 技术开发或科学研究的话, 那么 PDA 对您来说是一个将会进入行业的组织!



panies ranging from raw materials suppliers and distributors, consultants. Other membership categories include architects, independent sales representatives. Polyurea is defined by the reaction product of an isocyanate component and an alcoholiphatic in nature. It can be monomer, polymer, or any copolymer, or quasi-prepolymer, can be made of an amine-

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# Progress and Prospect of Spray Polyurea Elastomer Technology in CHINA

Biloxi, MS, USA, 8/3-2005



# That Was Polyurea Loves Sports then, This Is Polyurea Loves Olympic Games Now!



**Vienna, Austria, 21/11-2008**

# Polyurea Great Wall --- Weibo Huang



**Bruhl, Germany, 17/11-2009**



# Polyurea in CHINA --- Weibo Huang



Albuquerque, NM, 22/1-2009

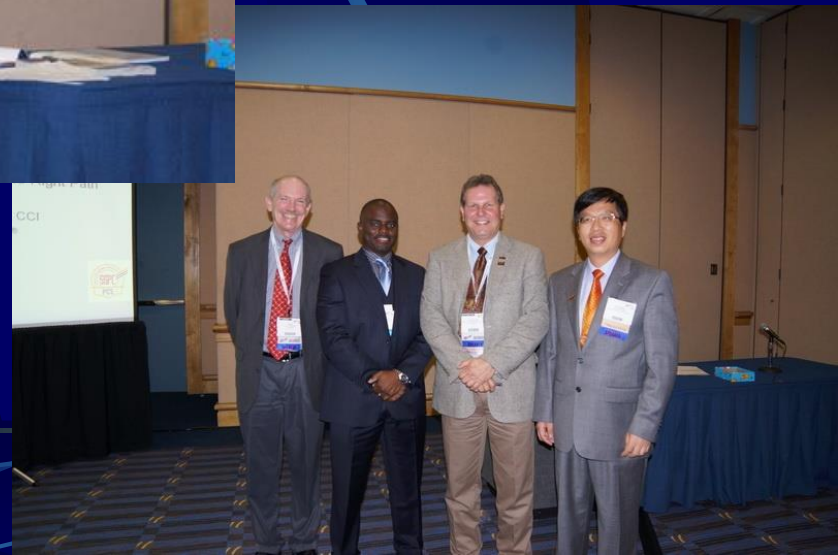
# The 11<sup>th</sup> PDA Annual Conference



Orlando, FL, 13/4-2010



# SSPC 2012 Annual Conference



Tampa, FL, 2/2-2012

# PDA---EU 2012 Annual Conference



Istanbul, Turkey  
14/11-2012





# 2009 China-Japan Polyurea Forum







# 2009 Japan-China Polyurea Forum



# Pakistan Coating Show 2017



**Lahore, Jan. 18, 2017**

**巴基斯坦, 拉合尔**



# The 8<sup>th</sup> International Conference on Key Engineering Materials



**Osaka, Japan**

**Mar. 18, 2018**



# Auckland, New Zealand Nov. 1, 2018



## QTG in New Zealand

**Minsk,  
Belarus  
April. 25,  
2019**



**QTG in  
Belarus**

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# Polyurea was born in US, developing in CHINA

2006, Beijing National Theater, 60,000 sm

2007, Beijing-Tianjin Intercity Railway,  
1,000,000 sm

2008, Beijing Olympic Games, 300,000 sm

2009, *Beijing-Shanghai High Speed Railway,*  
*12,000,000 sm*

2010, Shanghai Expo, 100,000 sm

Hengshan Reservoir, 3,000 sm

2011, Qingdao Sea Bridge, 3,000 sm

Shenzhen T3 Terminal, 300,000sm

2012, Jinan National Games, 160,000 sm

2012, Jinping Hydropower Dam, 39,000 sm



# **Polyurea was born in US, developing in CHINA**

**2013, Hong Kong-Zhuhai-Macau Bridge, 30,000 sm**

**2014, Zhuhai Changlong Water Park, 400,000, sm**

**2015, South to North Water Diversion, 100,000 sm**

**Xiluodu Hydropower Spillway , 1700, sm**

**2016, Zhanjiang Dong Island Bridge, 60,000 sm**

**Shenyang 7 Star Water Park, 60,000 sm**

**2017, Lanzhou West Dinosaur Park, 20,000, sm**

**2018, China Marine Rescue Center, 1,000 sm**

**2019, Nanyang Pumped Storage Power Station,  
100,000 sm**

**2019, The Parade Float of The 70<sup>th</sup> Anniversary of  
The Founding of P.R.CHINA, 6,000 sm**



# Qingdao Dolpnin Show Center, 100sm, 1999



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# Basketball Playground of MCRI

## 550 sm, 2000



# Audience Stand of Dalian Polar Zoo

## 5,000 sm, 2001



# Tennis Court of Qingdao University of Technology

## 450 sm, 2003





**Beijing National Theater**  
**60,000 sm, 2006**



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**Beijing-Tianjin Intercity Railway**  
**114.5Km, 1,000,000 sm, 2007**



**Beijing-Tianjin Intercity Railway**  
**114.5Km, 1,000,000 sm, 2007**

# Audience Stand of Beijing 2008 Olympic Games

## 300,000 sm, 2008





# Beijing-Shanghai High Speed Railway

1318Km, 12,000,000 sm, 2009



# Beijing-Shanghai High Speed Railway Summer Training at 40°C, 2009



# Beijing-Shanghai High Speed Railway Winter Training at -10°C, 2009



# Shanghai Expo Booth, 100,000 sm, 2010



# 2010, Hengshan Reservoir Dam



**3000 sm**



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**Qingdao Bay Bridge, 3,000 sm, 2011**



## Qingdao Bay Bridge, 3,000 sm, 2011



# Jinping Hydropower Dam 39,000 sm, 2012





# Jinping Hydropower Dam 39,000sm 2012



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The logo features a stylized palm tree and the acronym 'PDA' in a bold, black font. Below the logo, the text 'OCTOBER 17-18' and 'Costa Mesa CALIFORNIA' are displayed. At the bottom, the full name of the event and the venue are listed.

# Shenzhen T3 Terminal, 300,000 sm, 2011



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# Shenzhen T3 Terminal, 300,000 sm, 2011



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# Jinan National Games, 160,000 sm, 2012



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# Hong Kong-Zhuhai-Macau Bridge Immersed Tunnel, 30,000 sm, 2013



聚脲技术网  
[www.polyurea.cn](http://www.polyurea.cn)





聚脲技术网  
www.polyurea.cn

**Joint of  
Immersed  
Tunnel**



聚脲技术网  
www.polyurea.cn



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**Hong Kong-Zhuhai-Macau Bridge**

# Hong Kong-Zhuhai-Macau Bridge

## Slope Concrete, 36,000 sm, 2013



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# Hong Kong Zhuhai-Macau Bridge

## Slope Concrete





# Zhuhai Changlong Water Park

## 40,000 sm, 2014



# South to North Water Diversion, 1277Km, 100,000 sm, 2015



# 南水北调中线干线工程路线图



**Joint  
Concrete**

资料来源：国务院南水北调工程建设委员会办公室



聚脲技术网  
www.polyurea.cn

聚脲技术网  
www.polyurea.cn

# Xiluodu Spillway, 1,700 sm, 2015



# Xiluodu Spillway, 1,700 sm, 2015



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# Xiluodu Spillway, 1,700 sm, 2015



# Shenyang 7 Star Water Park, 60,000 sm 2016



禁止逆行  
NO RETROGRADE

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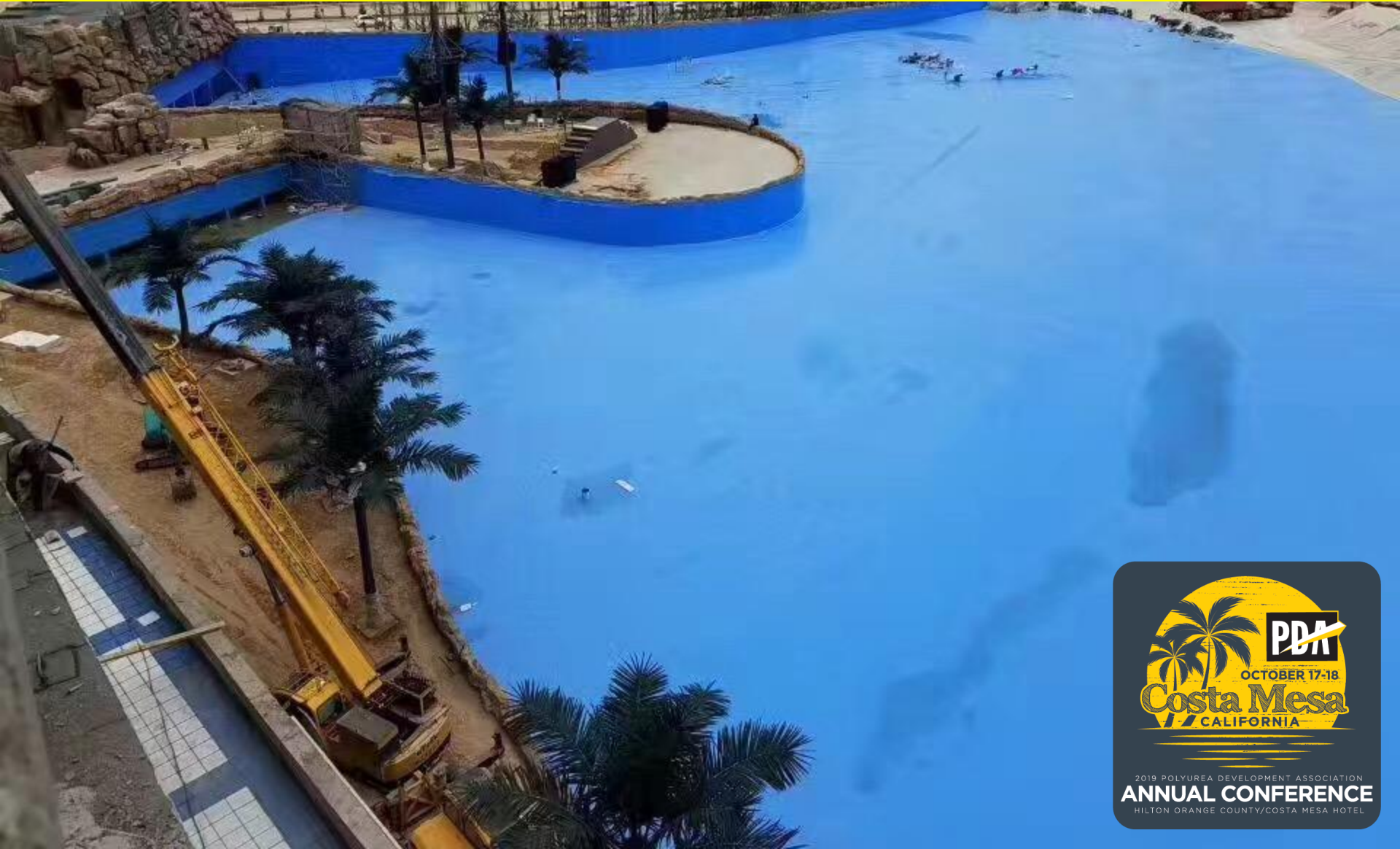
# Zhanjiang Dong Island Bridge, 60,000 sm, 2016





# Lanzhou West Dinosaur Park

## 20,000, sm, 2017



# China Marine Rescue Center, 1,000 sm 2018



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# Jinjiang Waste Stone Mine Transfer to Refuse Landfill, 15,000 sm, 2018



# Nanyang Pumped Storage Power Station

## 100,000 sm, 2019



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# The Parade Float of The 70<sup>th</sup> Anniversary of The Founding of P.R.CHINA, 6,000 sm, 2019



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# PDA Original Mission



# PDA Changed Its Direction

In the ensuing years, PDA has expanded its reach to include thick-film high performance elastomers as well as still being the leading voice of polyurea technology. By adding adjacent technologies like **urethanes and hybrids that have similar uses**, as well as related primers and topcoats, PDA has become a clearinghouse for applicators, formulators, raw material companies and others involved in our industry.



# China-US Polyurea Forum, 2010-4-1



**POLYUREA**  
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Recognizes the  
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Association  
Congratulations on the Registration of  
your Polyurea Waterproof Branch  
Organization and First National  
Conference  
[www.pdaonline.org](http://www.pdaonline.org)  
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2010-10-21



2010 POLYUREA DEVELOPMENT ASSOCIATION  
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中国聚脲防水技术分会和美国聚脲发展协会联盟协议签字仪式  
*Signing Ceremony of Agreement on Alliance Between PDA and CPA*



中国建筑防水协会  
[www.cnwb.net](http://www.cnwb.net)



# CNWB as Well as CPA

**China National Waterproofing of Building (CNWB)** signed agreement with PDA on Oct. 21, 2010. It established a sub-association called **China Polyurea Association (CPA)**. CPA depends on this agreement and PDA direction changed to promote spray polyurethane and hybrid in China market, especially in Beijing-Shanghai High Speed Railway as well as many projects. Much more seriously, they definite spray polyurea waterproofing as below:



# CNWB as Well as CPA

**Spray Polyurea Waterproofing Coating is a reaction of part A and B. Part A is aromatic or aliphatic isocyanate or its pre-polymer. Part B is amine mixing compounds.**

**Note: 1. If part B consisted of amine resin and amine chain extenders, the final product is called pure polyurea.**

**2. If part B consisted of hydroxy resin and amine chain extenders, the final product is called polyurethane-urea, or semi-polyurea.**



# CNWB as Well as CPA



Either pure polyurea or polyurethane and hybrid are all called **polyurea** in China market.

In my opinion, PDA should learn from SSPC and PDA-EU to give polyurea industry a clear definition. And come back to focus on

**Pure Polyurea.**

# SSPC Definition

**Polyurea:** A polyurea coating is based upon an isocyanate component and a resin blend component composed of amine terminated raw materials.

**Polyurea/Polyurethane Hybrid:** A polyurea/polyurethane hybrid coating is based upon an isocyanate component and a resin blend component composed of blends of amine terminated and hydroxy terminated raw materials

# PDA-EU Definition

**The cross-linking reaction takes place solely between the isocyanate and the amine-terminated compounds. Hydroxyl groups added through additives or pigment pastes should not have a significant influence on the cross-linking reaction.**

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**35,000 h  
QUV**



**19 Years Outdoor  
Exposure**

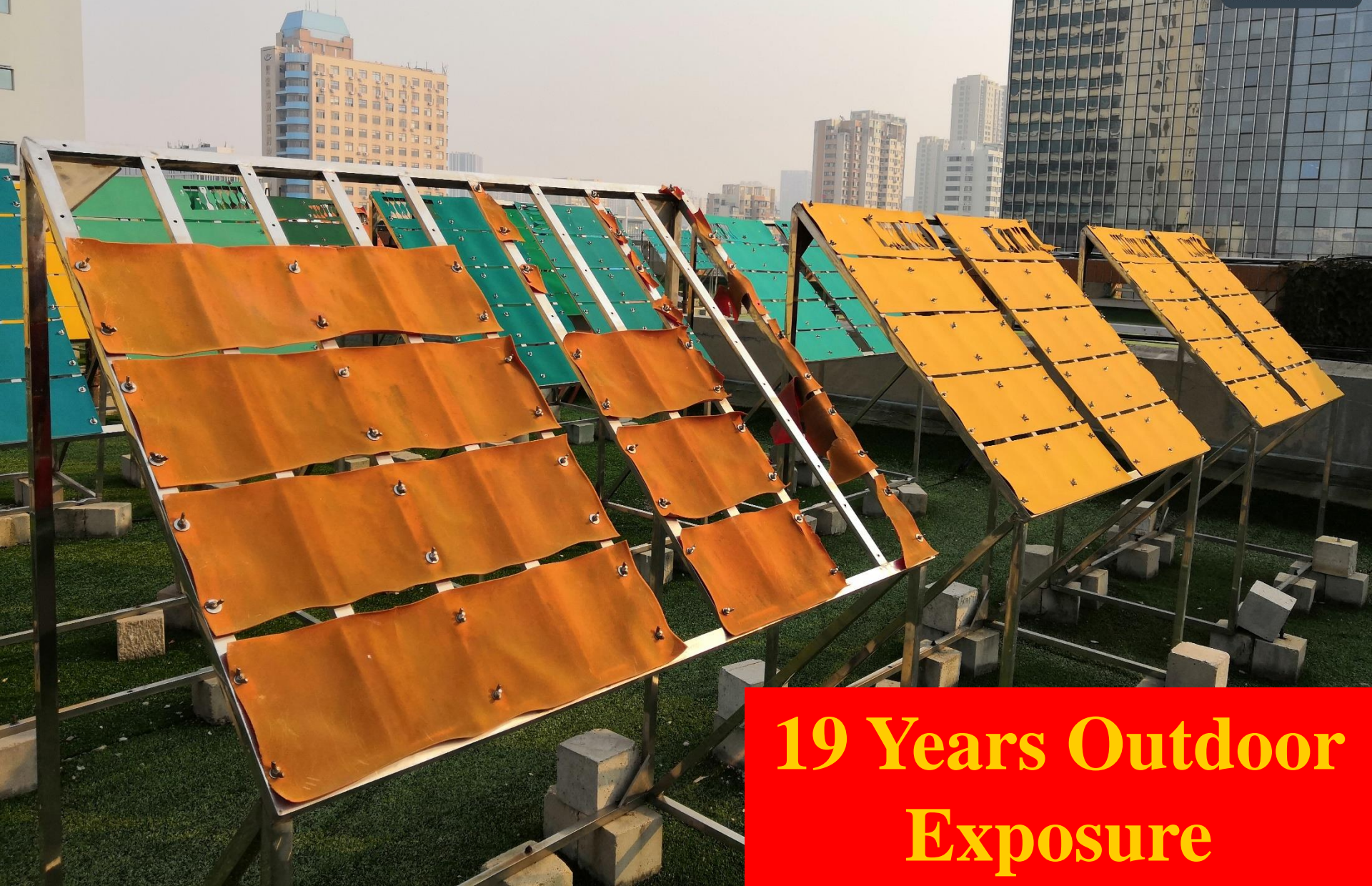
# Pure vs Fake Polyurea after 9 Years



**19 Years Outdoor  
Exposure**



# Pure vs Fake Polyurea after 9 Years



**19 Years Outdoor  
Exposure**

# Pure vs Fake Polyurea after 9 Years



**19 Years Outdoor  
Exposure**



# Blast Mitigation

Brand	Tensile	Elongation	Tear
SPUA-102	12.2	350	50.6
SPUA-1002	16.5	400	65.4
QTECH-190	22.8	450	75.5
<b>QTECH-420</b>	<b>35.3</b>	<b>244</b>	<b>135.0</b>
XXX-1	24.1	162	140.0
XXX-2	15.4	200	105.0
XXX-3	19.4	351	66.5

# Blast Mitigation



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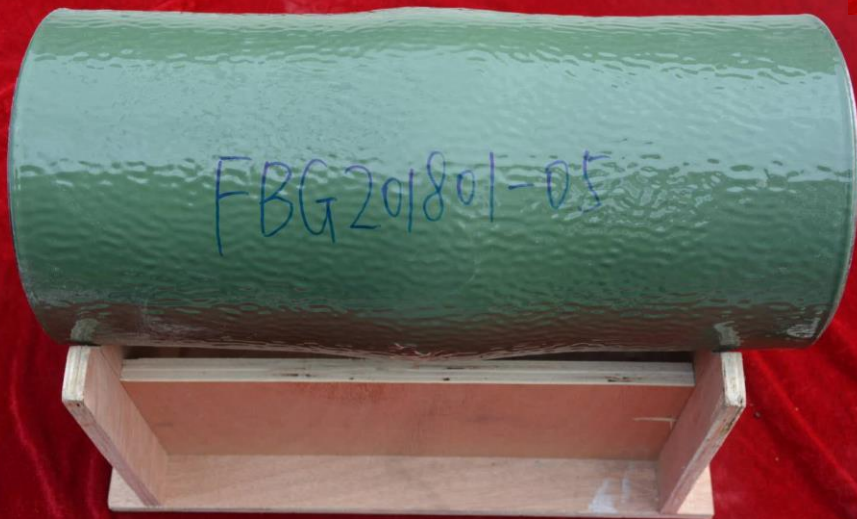
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# Blast Mitigation



**100g  
TNT**

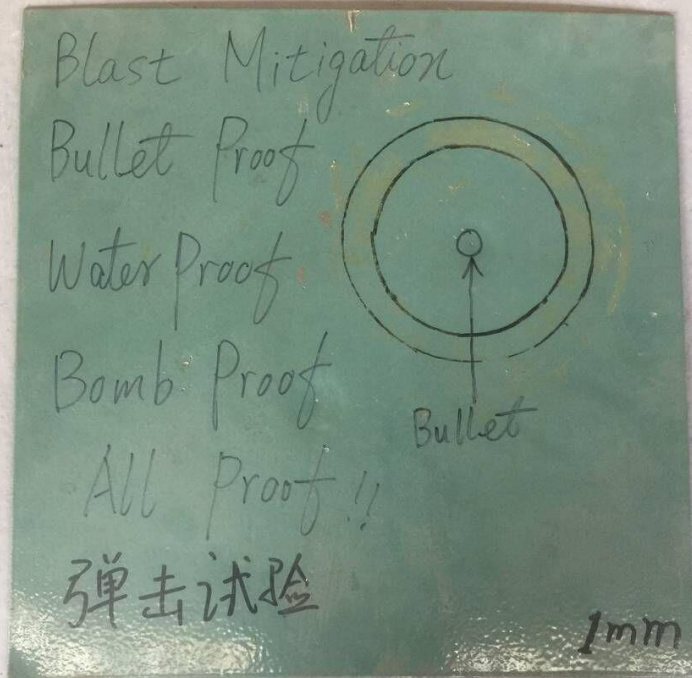
# Blast Mitigation



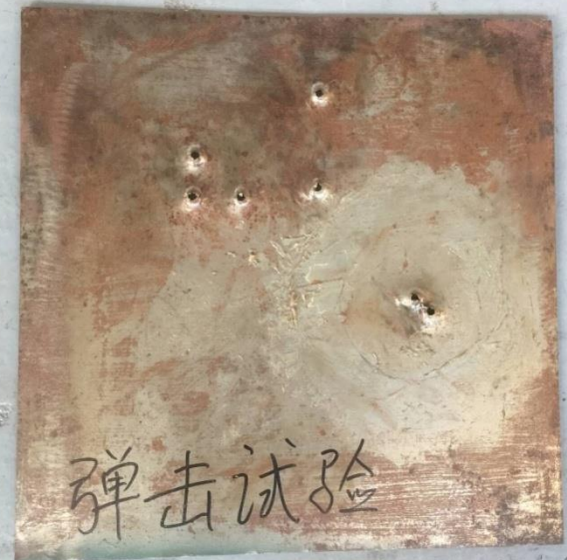
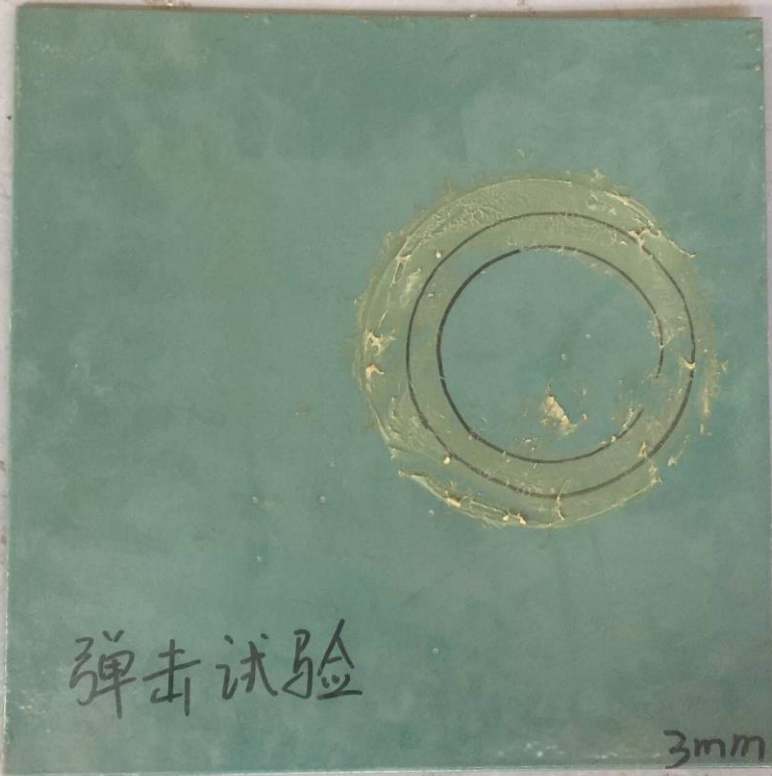
**200g  
TNT**



# Blast Mitigation



# Blast Mitigation



# Blast Mitigation



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## 六、应用—2 危险品罐体 运输车防护

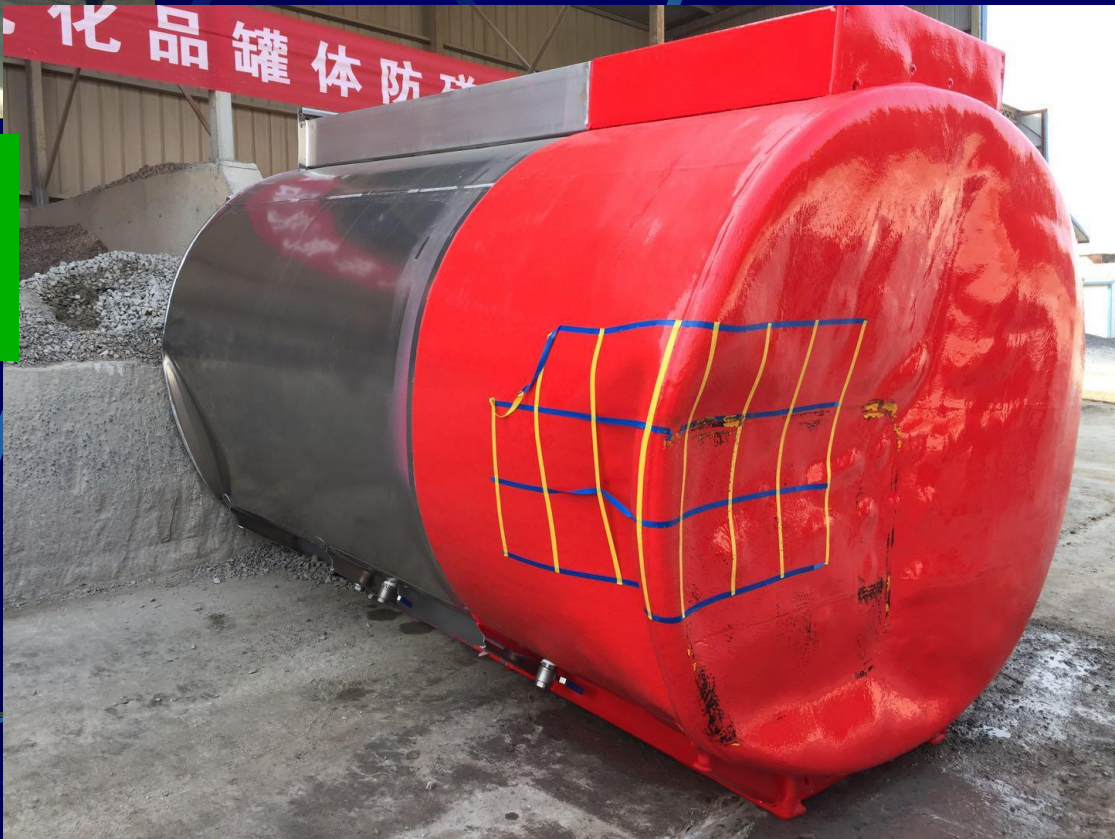


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**Deformation 91cm  
Crack and Leakage**

**Deformation 4 cm  
No leakage**



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HILTON ORANGE COUNTY/COSTA MESA HOTEL



**Forklift 17 ton, speed  
27Km/h  
Impact energy 470,000J**

**Forklift 17 ton,  
speed 33Km/h  
Impact energy 590,000J**





**Aliphatic  
Required**

**Chain Extenders**



**PDA**  
OCTOBER 17-18  
**Costa Mesa**  
CALIFORNIA

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# Thank You for Your Attention



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