Flammable refrigerant safety research and standard revision

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Agra, India

23-26th May, 2017

HCFC-22 alternative technical route

H C

R161

R290

。。。

HFC

R410A

R32

。。。

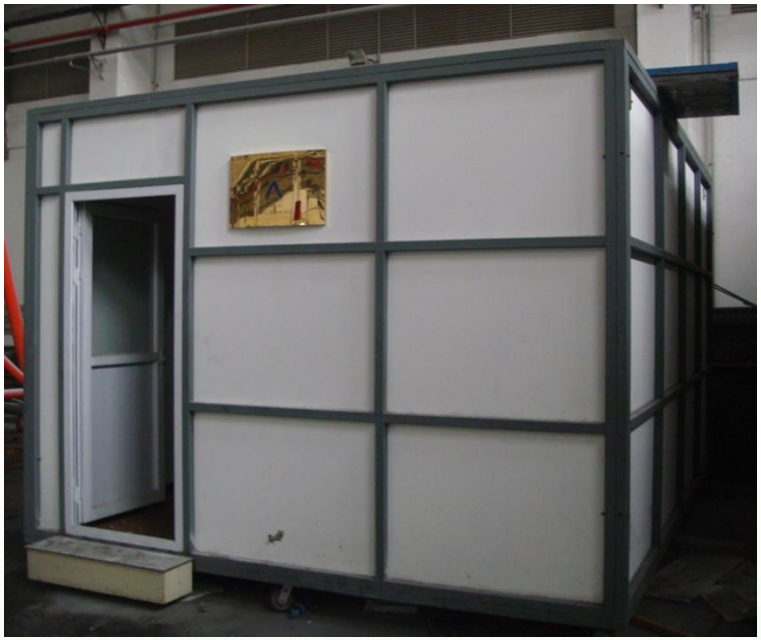
Other

R717

R744

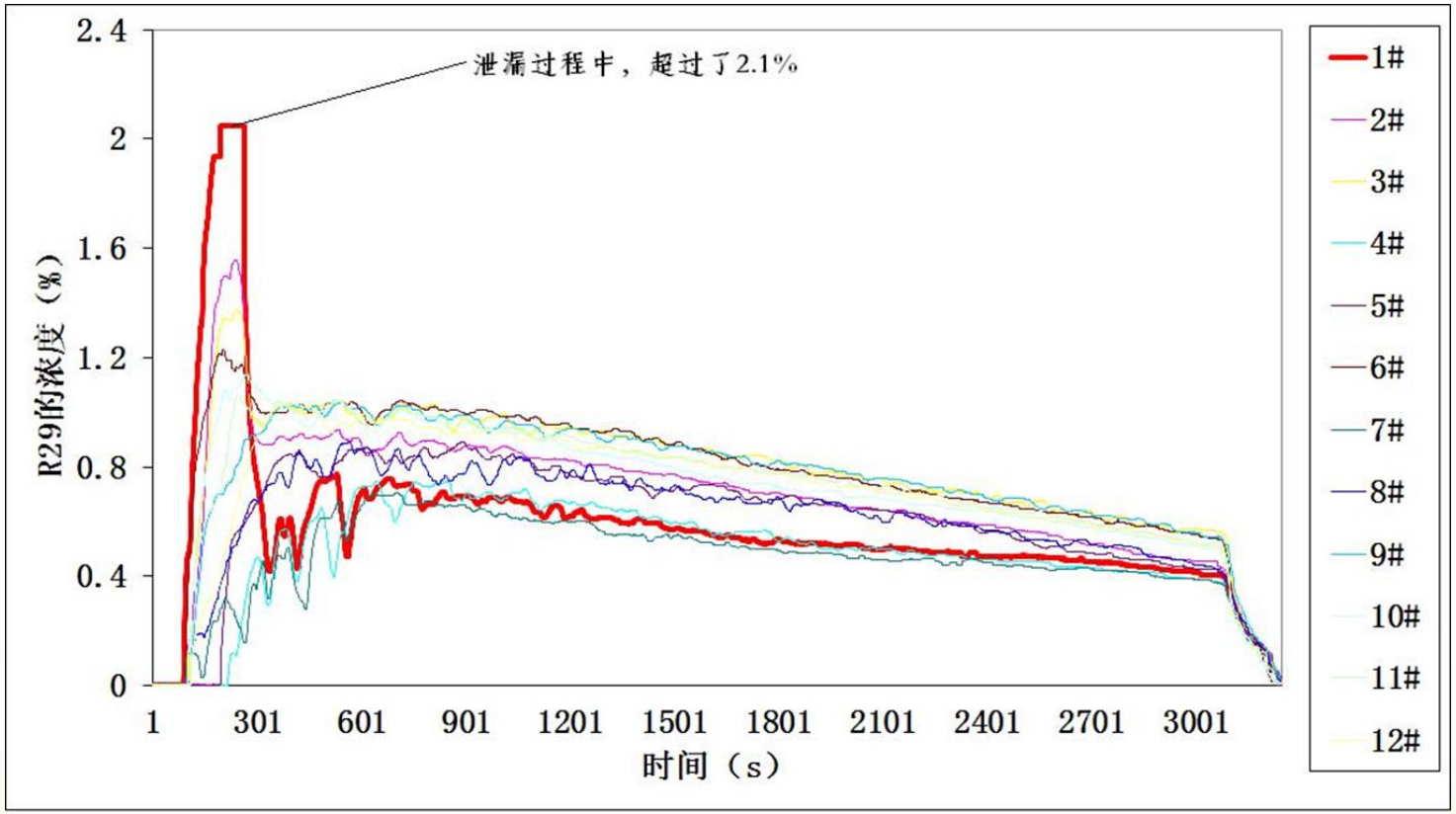
。。。

1、The leakage test

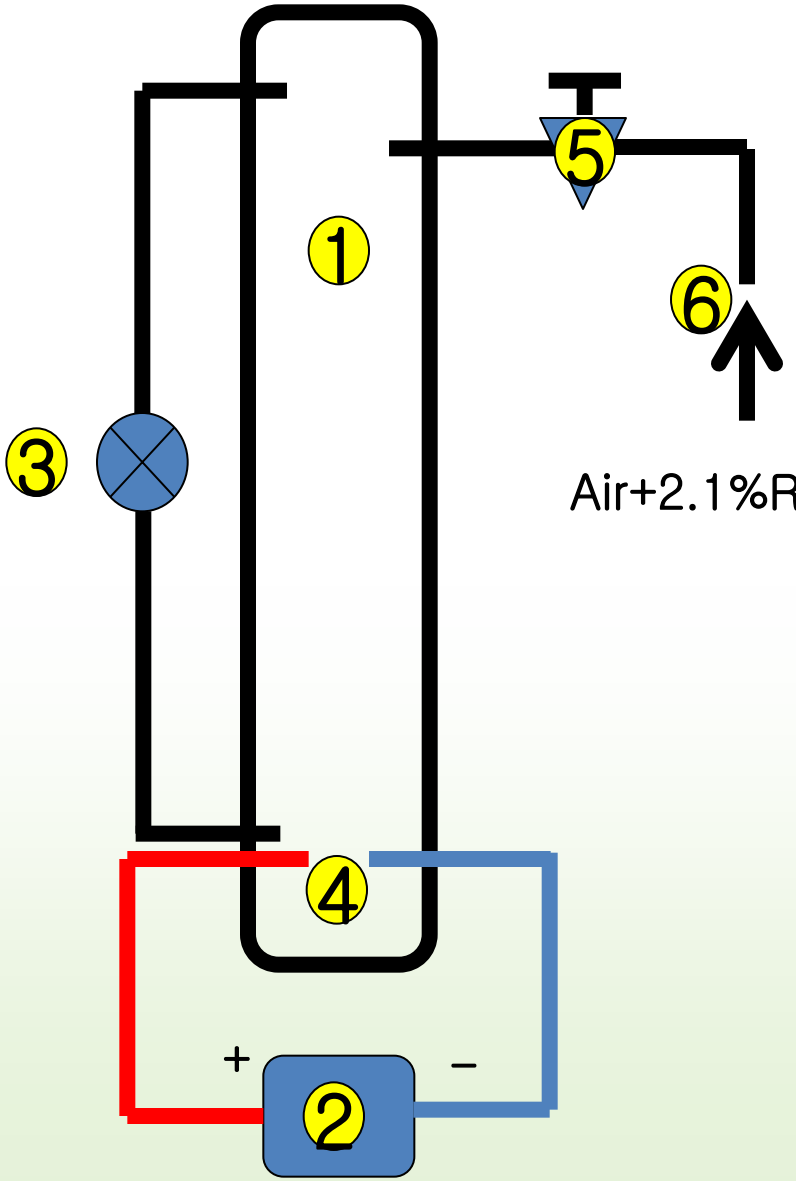


4.8m×3.6m×2.6m

h: 0.2m ; 0.8m; 1.5m



1) At floor level, the concentration within the room cannot reach the LFL.
2) The concentration only approaches or exceeds the LFL in an extremely localized region directly underneath the leak position



We designed a equipment for observing the situation of R290 combustion.

1. glasses pipe
2. electronic ignition device
3. circulating pump
4. spray point
5. valve
6. Gas inlet

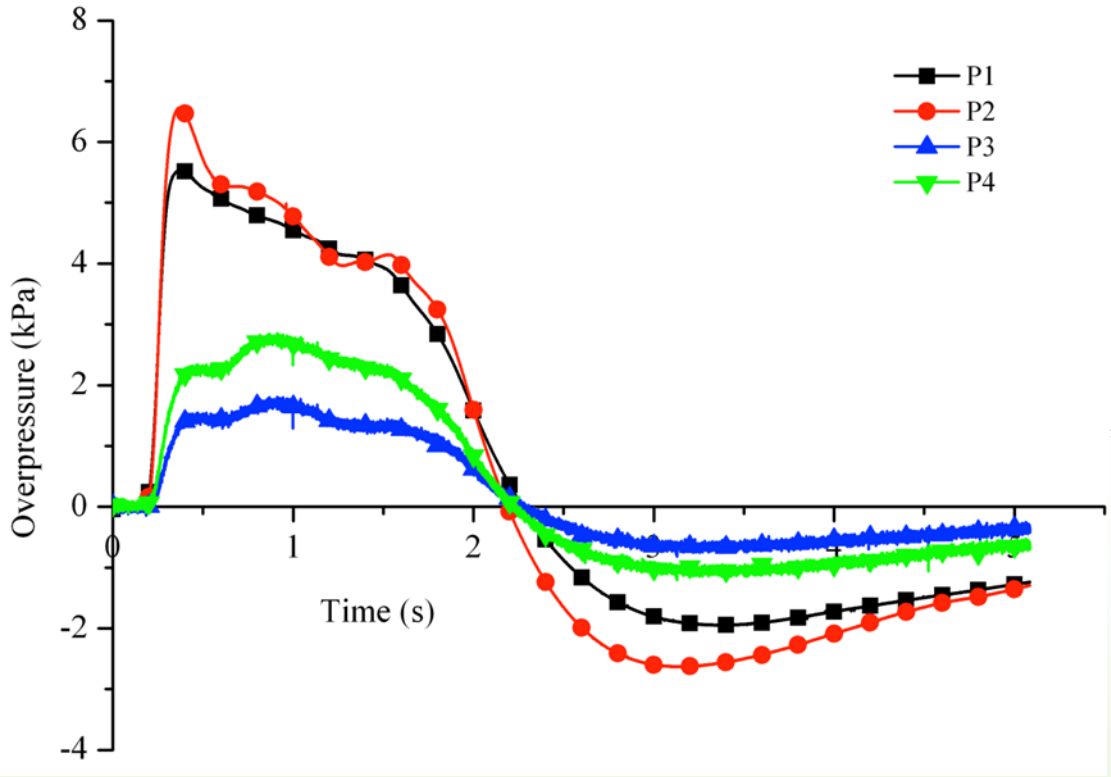
No.	R290 Concentration	result	No.	R290 Concentration	result
1	2.1%V/V+Air	NO	6	2.1%V/V+Air	NO
2	2.1%V/V+Air	🔥	7	2.1%V/V+Air	NO
3	2.1%V/V+Air	NO	8	2.1%V/V+Air	🔥
4	2.1%V/V+Air	NO	9	2.1%V/V+Air	NO
5	2.1%V/V+Air	NO	10	2.1%V/V+Air	NO

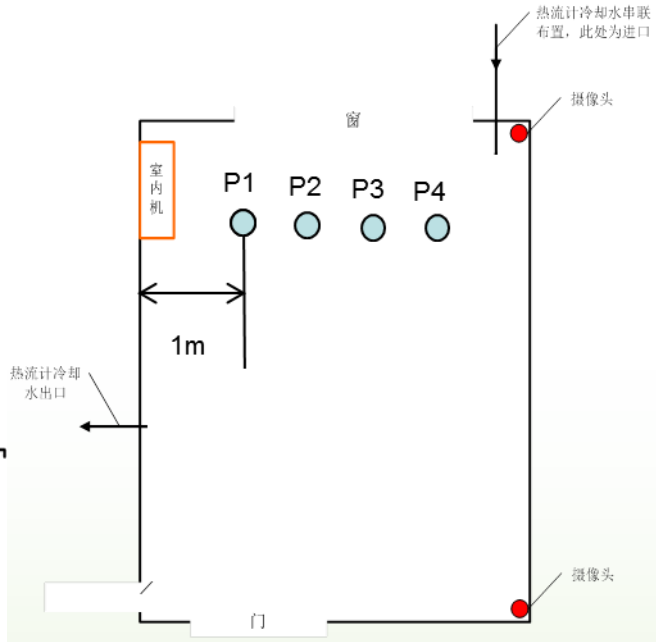
R290 Leak

Ignition combustion

Natural extinction

2. Ignition test of indoor unit



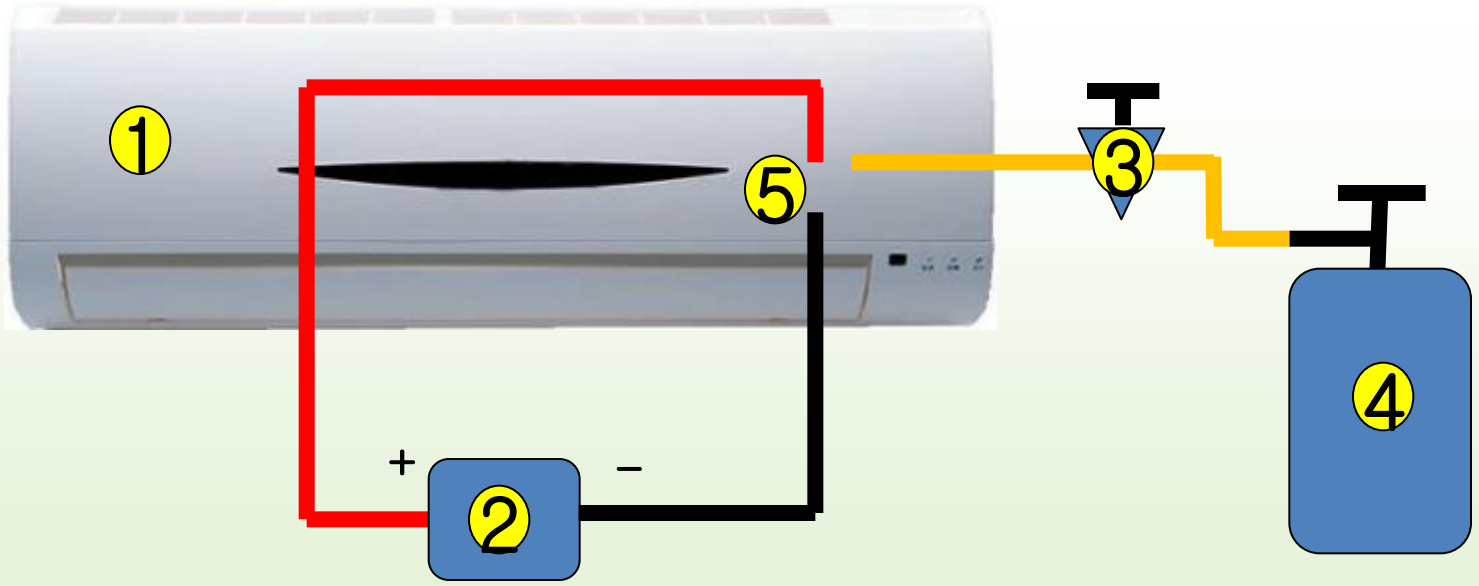


The highest overpressure when the indoor unit was fired is about 6.5 kpa.

We designed the device, used to simulate the R290 in the indoor unit internal leakage and ignition.

① Indoor unit ② electronic ignition device

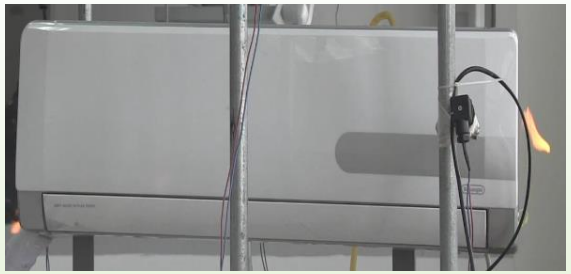
③ Adjusting valve ④ R290 tank ⑤ spray point



No.	Ambient temperature	Leakage rate	result
1	27.5℃	3g/s	
2	27.5℃	5g/s	
3	27.5℃	8g/s	
4	27.5℃	12g/s	
5	27.5℃	17g/s	

R290 Leak

Ignition combustion

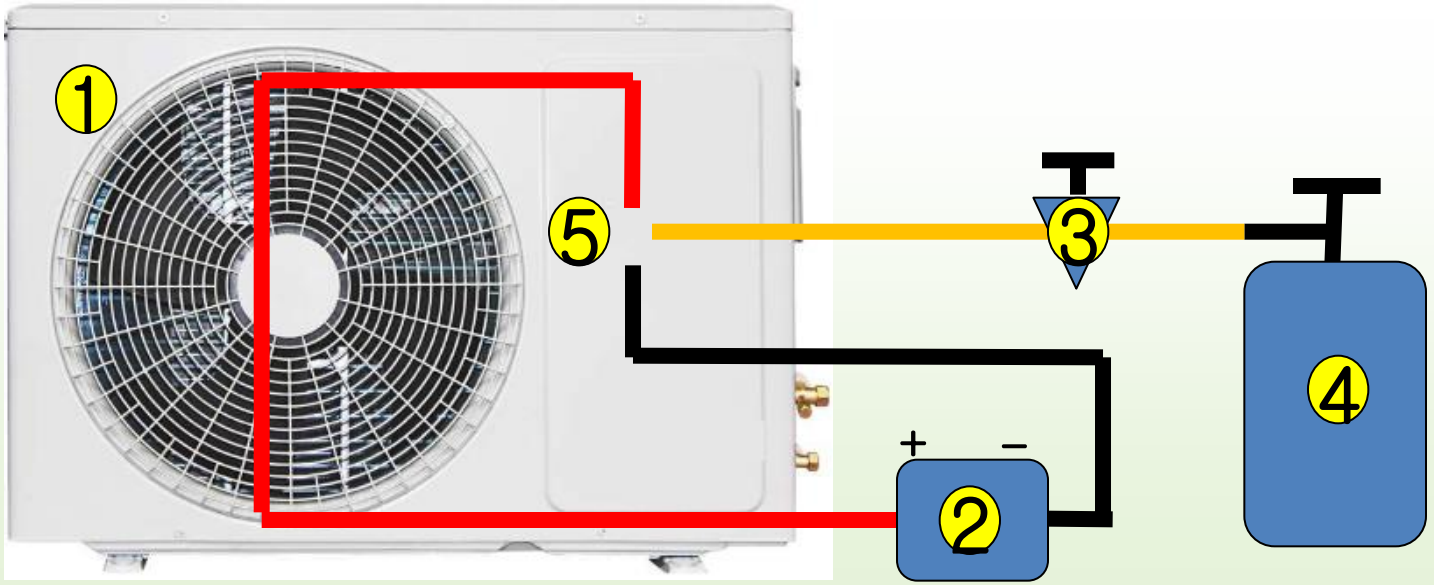


Natural extinction

We designed the same device, used to simulate the R290 in the outdoor unit internal leakage and ignition.

① Outdoor unit ② electronic ignition device

③ Adjusting valve ④ R290 tank ⑤ spray point



No.	Ambient temperature	Leakage rate	result
1	26.7℃	5g/s	NO
2	26.7℃	8g/s	
3	26.7℃	12g/s	
4	26.7℃	17g/s	
5	26.7℃	23g/s	

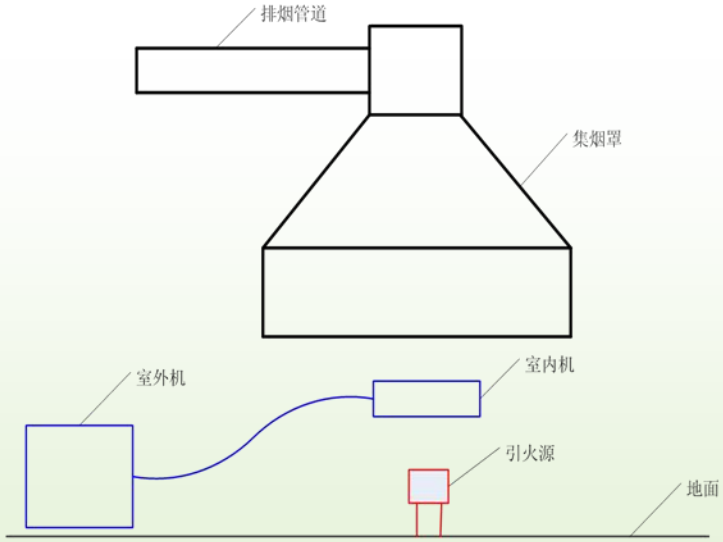
R290 Leak

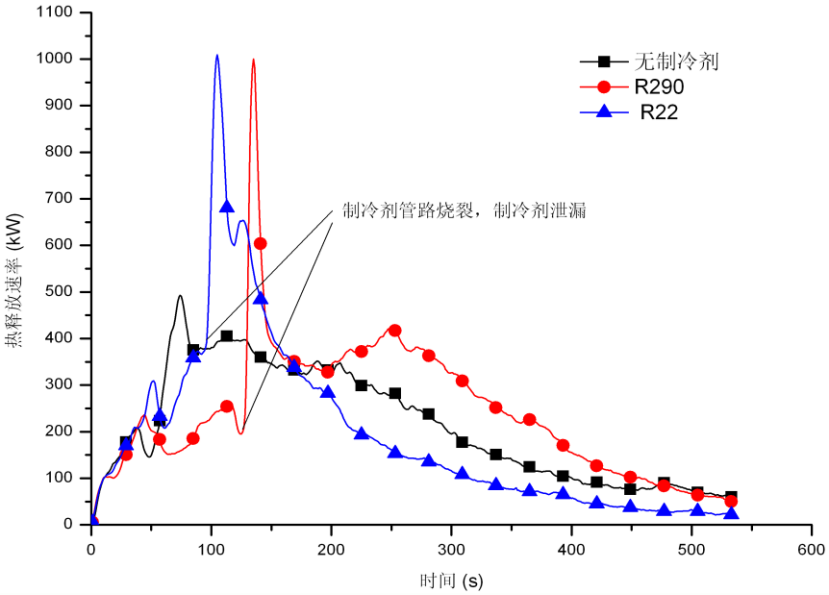
Ignition combustion

Natural extinction

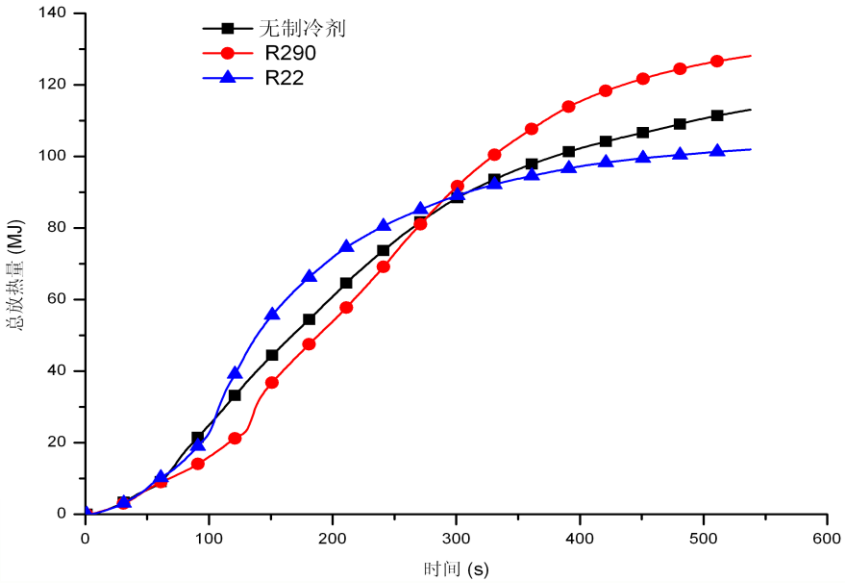
3. Test of combustion of RAC

We simulate the research of R290 and R22 of indoor unit on the fire, evaluate its safety.





Heat flux

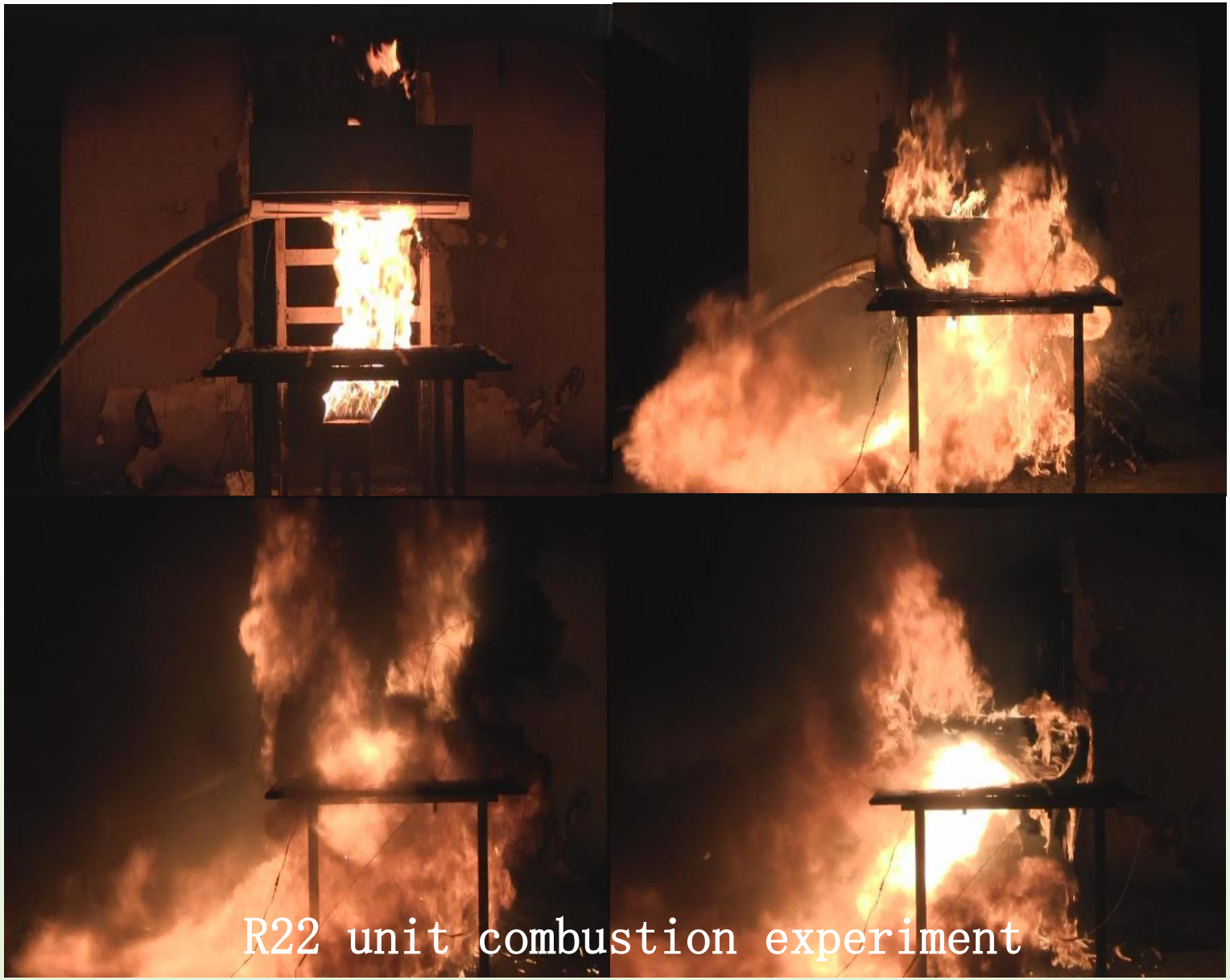


Heat

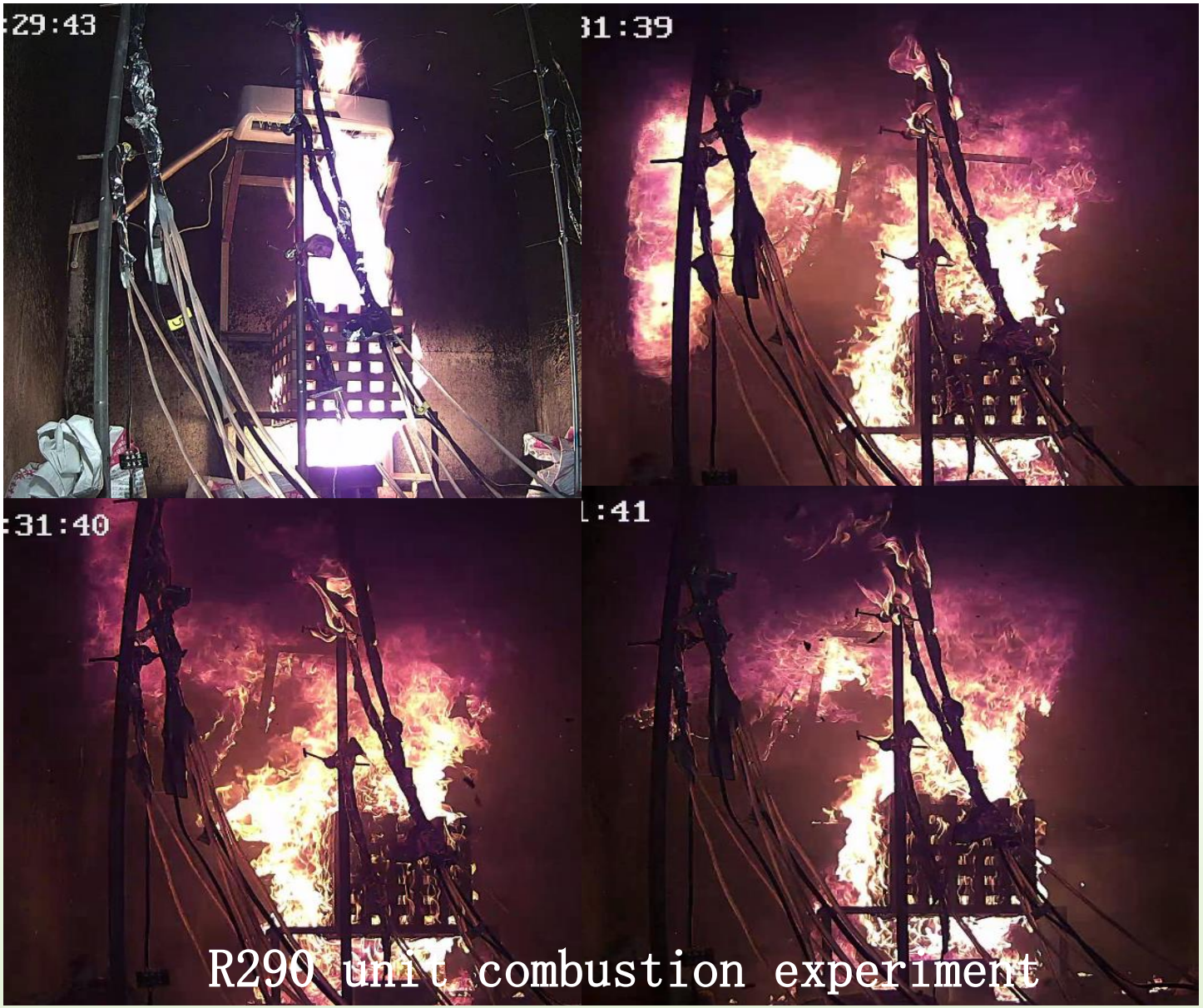
1) Similar maximum heat flux for R290 and R22

2) Similar total heat for R22,R290 and no refrigerant

3) The most heat is from RAC itself



R22 unit combustion experiment



R290 unit combustion experiment

R32 unit combustion experiment

In view of the safety research results, the IEC standard about charging amount limit is too strict. In order to promote the application of R290 in room air conditioning, and make the standards more reasonable, We have carried out research on safety standards.

1、Domestic standards

2012年

GB4706.32-2012 standard

Add the technical requirements and test methods for "flammable refrigerants"

CCC compulsory certification standa rd for air conditioners

GB 4706.32-2012

IDT：IEC 60335-2-40:2005


ICS 13.120
Y 67

GB

中华人民共和国国家标准

GB 4706.32—2012/IEC 60335-2-40:2005
代替 GB 4706.32—2004

家用和类似用途电器的安全
热泵、空调器和除湿机的特殊要求

Household and similar electrical appliances—Safety—
Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers

(IEC 60335-2-40:2005,IDT)

2012-06-29 发布　　2013-05-01 实施

中华人民共和国国家质量监督检验检疫总局
中国国家标准化管理委员会　发布

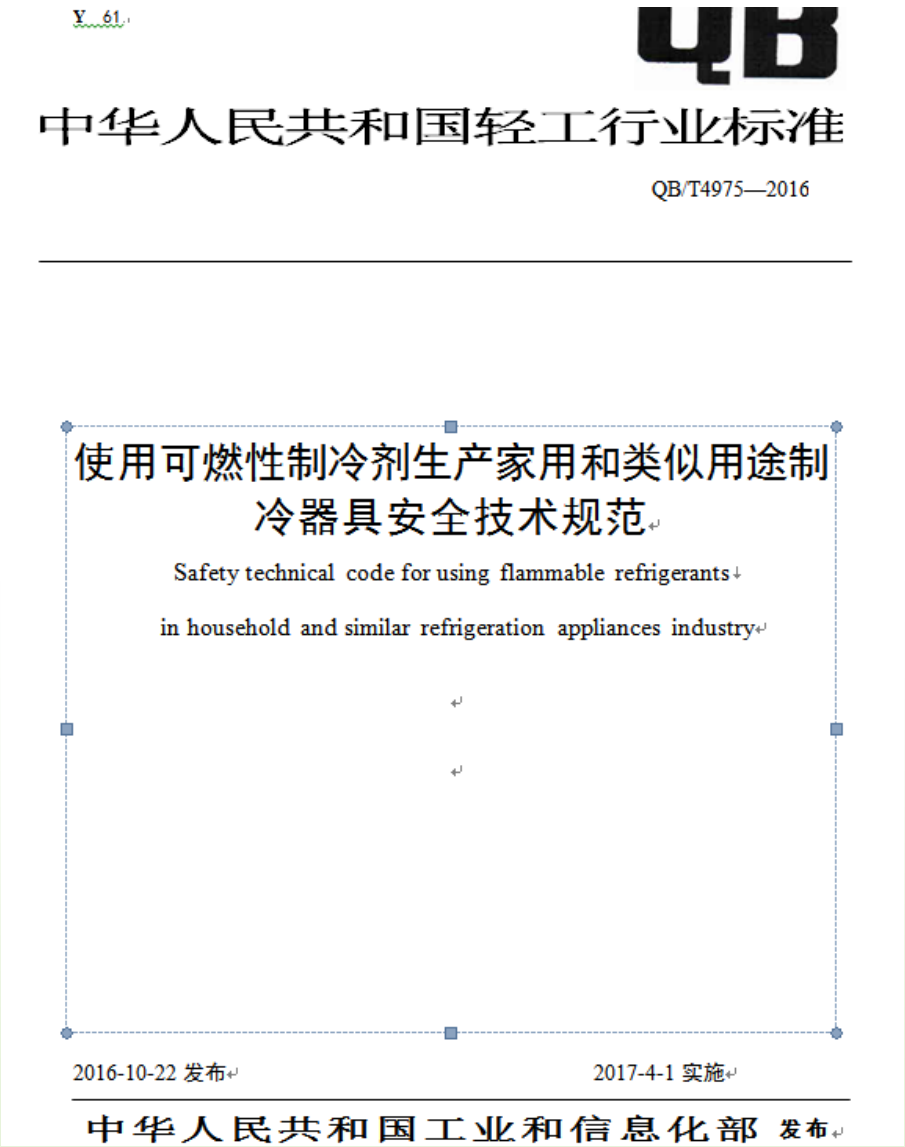
2016年

Based experiences from

conversions and standards

Cover the safety requirements on

related process in the line



Y 61

QB

中华人民共和国轻工行业标准

QB/T4975—2016

使用可燃性制冷剂生产家用和类似用途制冷器具安全技术规范

Safety technical code for using flammable refrigerants in household and similar refrigeration appliances industry

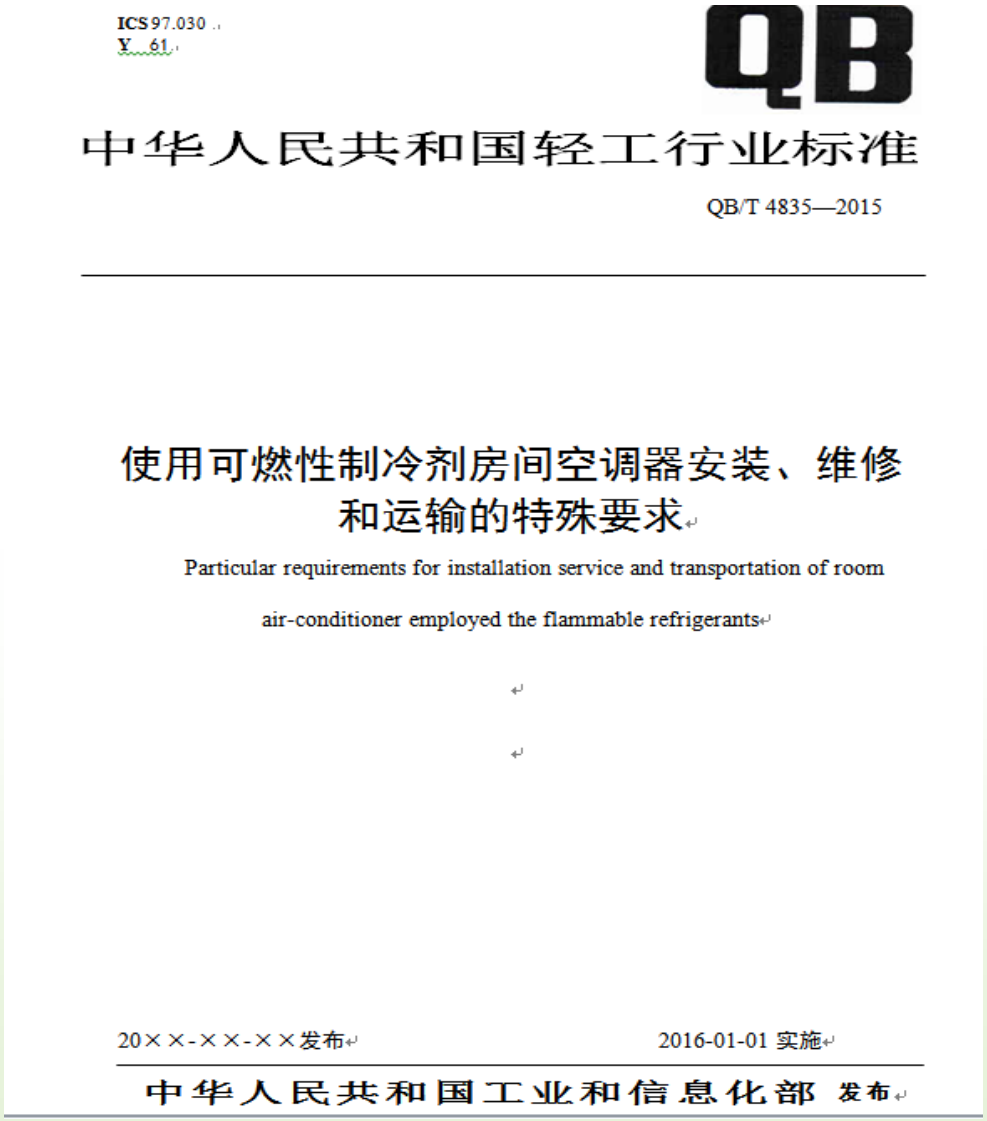
2016-10-22 发布

2017-4-1 实施

中华人民共和国工业和信息化部 发布

2015年

Put forward the particular requirements on installing and servicing based on the current product .



ICS 97.030
Y 61

QB

中华人民共和国轻工行业标准

QB/T 4835—2015

使用可燃性制冷剂房间空调器安装、维修和运输的特殊要求

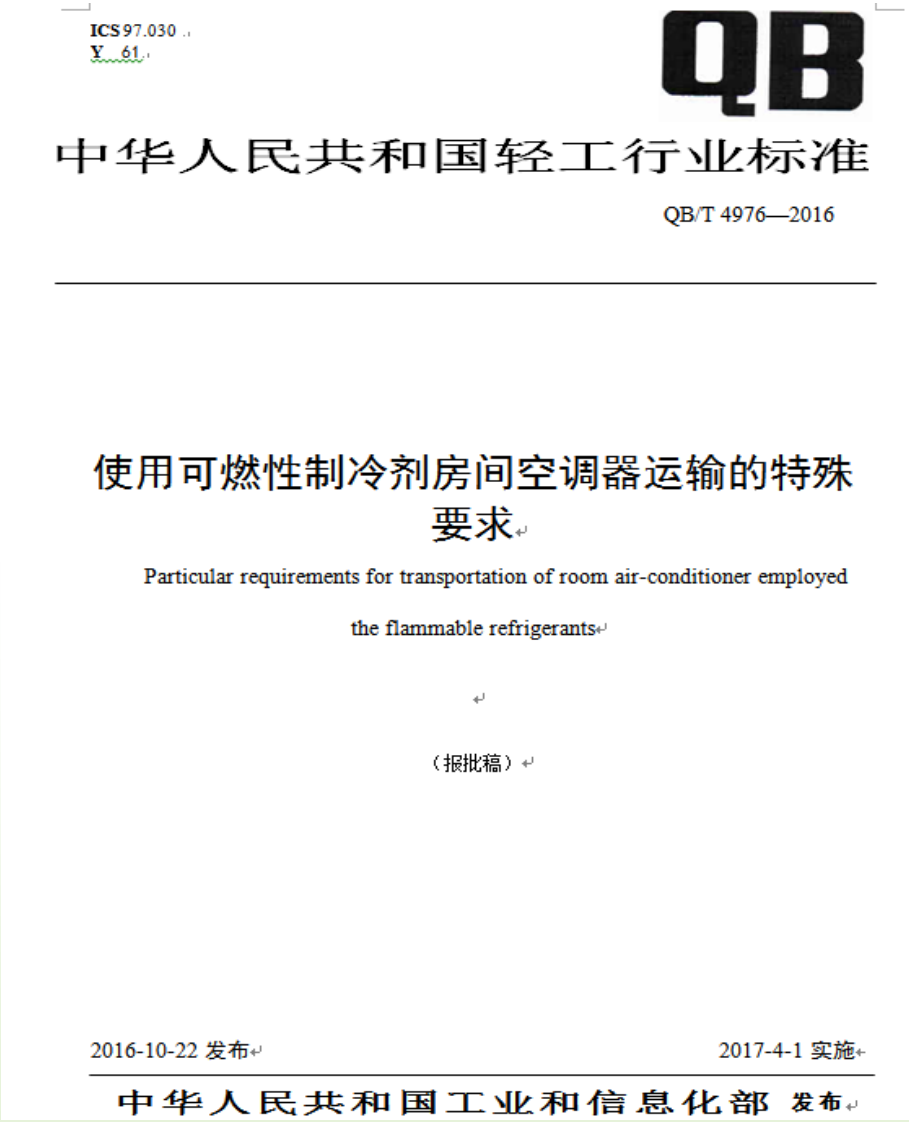
Particular requirements for installation service and transportation of room air-conditioner employed the flammable refrigerants

20××-××-××发布　　2016-01-01 实施

中华人民共和国工业和信息化部 发布

2016年

Additional requirements on transporting RAC using A3, such as package, vehicle and load and unload.



ICS 97.030
Y 61

QB

中华人民共和国轻工行业标准

QB/T 4976—2016

使用可燃性制冷剂房间空调器运输的特殊要求

Particular requirements for transportation of room air-conditioner employed the flammable refrigerants

（报批稿）

2016-10-22 发布　　2017-4-1 实施

中华人民共和国工业和信息化部 发布

2、International standards

Participate in WG09 and WG16；

Host the WG16 meetings in China: Shenzhen and Hangzhou

China Proposal on h_0 for calculation of m_{max} and A_{min}

Statement:

Fundamentally we think that the standard should play the role to conduct the techno and product design. The standard should not support one technology and be against However, the proposed language at the meeting WG9, attached at the end of our pr generalize the barriers to number of product development. A standard should provid requirements for safety, and avoid limiting the technology and product development unnecessarily limiting the product design or application.

The reasons to China proposal:

1. *The certain value for the installation height in the standard is inconsistence wi reality, 100 million room air-conditioners were produced in year 2012 in China, v approximate 80% of the world market, and more than 70% of the split ones wer range of 2.2m-2.4m.*

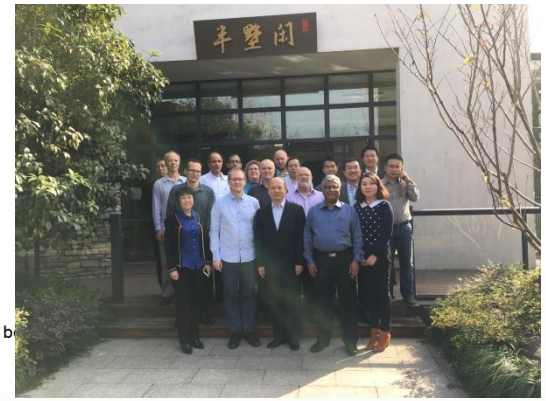
Proposed draft for maximum charge with ventilation

- **Background**
- This document is based on the document of GG21 150809, which is for maximum refrigerant charge mass for A2 and A3 with ventilation

- **Proposal**

Appliances using A2 and A3 refrigerants with incorporated fan dilution

When the fan incorporated to an appliance is continuously operated or operation is initiated by a **refrigerant detection system** with sufficient air-flow rate, the maximum **refrigerant charge** can b increased or minimum installation area can be reduced according to following.



Template for comments and secretariat observations

Date: | Document: | Project:

MB/ NC[1]	Line number. (e.g. 17)	Clause/ Subclause. (e.g. 3.1)	Paragraph/ Figure/ Table/. (e.g. Table 1)	Type of comment[2]	Comments	Proposed change	Observations of the secretariat
CN-6	1435 - 1442	22.116		te	China NC thinks this statement is not only suitable for A2L refrigerant. According to the experiences of China air conditioner industry, if the pipe complies with the three requirements in line 1440 – 1442, it should be not considered a source of leaked refrigerant. It is not related with the kind of refrigerants.	Modify the first sentence by following statement: "Refrigerant pipes containing flammable refrigerant which connect refrigeration system components shall not be considered a source of leaked refrigerant for the purpose of evaluating potential for fire or explosion hazard relative to potential ignition sources within the appliances if the piping within the area of the appliance to be evaluated complies with all of the following:"	
CN-7	1462 - 1491	22.116		te	China NC can not understand why the electrical load (Le) is related with the burning velocity. We think the electrical load is related with voltage and current in physics. China NC suggests that IEC 60335-2-40 should not invent the new physics formula.	Delete line 1462 - 1491	
CN-8	1496 - 1498	22.117		te	China NC thinks that IEC 60335-2-40 is a standard to ensure the appliances to meet the relevant safety requirements. If this rational is right, the related safety value specified in this standard should be as safer as possible. It means, China NC thinks that the safer value should be adopted if there are two optional values. So, it is not reasonable to determine the maximum allowable surface temperature by the highest of AIT reduced by 100k or hot surface	Modify the sentence by the following statement: "The maximum allowable surface temperature is determined by the lowest of AIT reduced by 100k or, if tested per annex KK, the hot surface ignition temperature reduced by 100k, but not higher than 700 ℃"	


环保低碳
UNIDO · UNEP · FECO · CHEAA · GIZ
Thank you!
The natural ,the best!