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National Iranian Gas Co.

مدیریت پژوهش و فناوری

Research and Technology Management

امور تدوین استانداردها

Standardization Division

IGS

Iranian Gas Standards

Specification for :

مشخصات فنی :

Granular Activated Carbon for Water Treatment for  
Drinking & Industrial Supplies

گرانول کربن فعال برای سیستم آبرسانی شرب و صنعتی

APPROVED

## **FOREWORD**

This standard is intended to be mainly used by **NIGC** and contractors and has been prepared on interpretation of recognized standards , technical documents , knowledge ,backgrounds and experiences in gas industries at national and international levels.

Iranian Gas Standards (**IGS**) are prepared , reviewed and ammended by technical standard committees within NIGC Standardization Div. and submitted to the **NIGC's "STANDARDS COUNCIL"** for approval .

**IGS** Standards are subject to revision , amendment or withdrawal , if required , thus the latest edition of **IGS** shall be checked/inquired by **NIGC** users .

This standard must not be modified or altered by the end users within **NIGC** and her contractors. Any deviation from normative references and/or well known manufacturers specifications must be reported to Standardization div.

Any comments from concerned parties on **NIGC** distributed **IGS** are welcome to technical standards committees and will receive serious attention and consideration should a revision to standards is recommended .

## **GENERAL DEFINITIONS :**

Throughout this standard the following definitions , where applicable , should be followed :

1- "**STANDARDIZATION DIV.**" has been organized to deal with all aspects of industrial standards in NIGC . Therefore , all queries for clarification or amendments are requested to be directed to the mentioned div.

2- "**COMPANY** " : refers to national iranian gas company .

3- "**SUPLIER**" : refers to a firm who will supply the service , equipment or material to igs specification whether as the prime producer or manufacturer or a trading firm .

4- "**SHALL**" : is used where a provision is mandatory.

5- "**SHOULD**" : is used where a provision is advised only.

6- "**MAY**" : is used where a provision is completely discretionary.

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## پیشگفتار

- ۱- این استاندارد/دستورالعمل بمنظور استفاده اختصاصی در شرکت ملی گاز ایران و شرکتهای فرعی وابسته تهیه شده است.
- ۲- شرکت ملی گاز ایران در مورد نیازهای عمومی از استانداردهای وزارت نفت (IPS) و در مورد نیازهای اختصاصی از استانداردهای اختصاصی خود (IGS) استفاده می نماید.
- ۳- استانداردهای شرکت ملی گاز ایران (IGS) توسط کمیته های تخصصی استاندارد متشکل از کارشناسان بخش های مختلف و یا مشاور تهیه می شود و توسط شورای استاندارد (منتخب هیئت مدیره شرکت ملی گاز ایران) به تصویب میرسند.
- ۴- در تنظیم متن استانداردهای (IGS) از کلیه منابع شناخته شده استاندارد، اطلاعات فنی - تخصصی مربوط به صنایع گاز دنیا، مشخصات فنی تولیدات سازندگان معتبر جهانی و نیز از نتیجه تحقیقات و تجربیات کارشناسان و متخصصان داخلی بر حسب مورد استفاده می شود. همچنین بمنظور استفاده هر چه بیشتر از تولیدات داخلی قابلیت های سازندگان داخلی نیز مورد توجه قرار میگیرد.
- ۵- استانداردها از طریق پایگاه اینترنتی شرکت \* و یالوح فشرده (CD) در اختیار واحدها و کاربران قرار می گیرد .
- ۶- استانداردها بطور متوسط هر ۵ سال یکبار و یادر صورت ضرورت زودتر، مورد بازنگری و بروزرسانی قرار میگیرند. بنابراین کاربران باید همیشه آخرین نگارش را مورد استفاده قرار دهند.
- ۷- هرگونه نظر و یا پیشنهاد اصلاح در مورد استانداردها مورد استقبال و بررسی قرار خواهد گرفت و در صورت تأیید، استاندارد مربوطه نیز مورد تجدیدنظر قرار خواهد گرفت .

## تعاریف عمومی

در متن استانداردهای (IGS) از تعاریف و اصطلاحات زیر استفاده میشود.

- ۱- "شرکت" (COMPANY): منظور از شرکت "شرکت ملی گاز ایران" و یا شرکتهای فرعی وابسته میباشد.
- ۲- "فروشنده" (SUPPLIER/VENDOR): به فرد یا موسسه ای اطلاق میگردد که تعهدی رانسبت به شرکت تقبل نموده است.
- ۳- "خریدار" (PURCHASER): منظور از خریدار "شرکت ملی گاز ایران" و یا شرکتهای فرعی وابسته میباشد.
- ۴- "SHALL": در مواردی بکاربرده میشود که انجام خواسته مورد نظر اجباری است
- ۵- "SHOULD": در مواردی بکاربرده میشود که انجام خواسته مورد نظر ترجیحی و درعین حال اختیاری است
- ۶- "MAY": در مواردی بکاربرده میشود که انجام کار به شکل مورد بحث نیز قابل قبول میباشد

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**GRANULAR ACTIVATED CARBON FOR WATER TREATMENT FOR**  
**DRINKING & INDUSTRIAL SUPPLIES**

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## 1. SCOPE

THIS STANDARD SPECIFICATION GIVES THE PROCEDURE FOR PURCHASING GRANULAR ACTIVATED CARBON FOR USE , AS AN ADSORPTION MEDIA , IN THE TREATMENT OF DRINKING AND INDUSTRIAL WATER SUPPLIES .

## 2. REFERENCES

THROUGHOUT THIS STANDARD SPECIFICATION THE FOLLOWING STANDARDS AND CODES ARE REFERRED TO . THE EDITIONS OF THESE STANDARDS AND CODES THAT ARE IN EFFECTED AT THE TIME OF ISSUES OF THIS STANDARD SPECIFICATION ( 2000 ) SHALL , TO THE EXTENT SPECIFIED HEREIN , FORM PART OF THIS STANDARD SPECIFICATION . THE APPLICABILITY OF CHANGES IN STANDARDS AND CODES THAT OCCUR AFTER THE DATE OF THIS STANDARD SPECIFICATION SHALL BE MUTUALLY AGREED UPON BY THE PURCHASER AND SUPPLIER AND/OR MANUFACTURER .

### ASTM ( AMERICAN SOCIETY FOR TESTING AND MATERIALS )

D 2862 – 82 ( 1987 ) " TEST METHOD FOR PARTICLE SIZE DISTRIBUTION OF GRANULAR ACTIVATED CARBON "

D 2867 – 83 ( 1988 ) " TEST METHOD FOR MOISTURE IN ACTIVATED CARBON "

D 3802 – 79 ( 1990 ) " TEST METHOD FOR BALL – PAN HARDNESS OF ACTIVATED CARBON "

D 3860 – 89 " PRACTICE FOR DETERMINATION OF ADSORPTIVE CAPACITY OF CARBON BY ISOTHERM TECHNIQUE "

D 3922 – 89 " PRACTICE FOR ESTIMATING THE OPERATING PERFORMANCE OF GRANULAR ACTIVATED CARBON FOR REMOVAL OF SOLUBLE POLLUTANTS FROM WATER "

D 4607 – 86 ( 1990 ) " TEST METHOD FOR DETERMINATION OF IODINE NUMBER OF ACTIVATED CARBON "

D 4820 – 89 " TEST METHOD FOR CARBON BLACK SURFACE AREA BY MULTIPOINT B.E.T. NITROGEN ADSORPTION "

### AWWA ( AMERICAN WATER WORKS ASSOCIATION )

B 604 – 74 " STANDARD FOR GRANULAR ACTIVATED CARBON "

### BSI ( BRITISH STANDARDS INSTITUTION )

BS 6920 : PART 1 ; 1990 " SUITABILITY OF NON – METALLIC PRODUCTS FOR USE IN CONTACT WITH WATER INTENDED FOR HUMAN CONSUMPTION WITH REGARD TO THEIR EFFECT ON THE QUALITY OF THE WATER "

### DIN ( DEUTSCHES INSTITUT FUR NORMUNG )

19603 " ACTIVATED CHARCOAL FOR WATER TREATMENT "

### **3. MATERIAL AND MANUFACTURE**

THE SUPPLIER AND/OR MANUFACTURER SHALL SUPPLY ACTIVATED CARBON CAPABLE TO IMPROVE THE TASTE AND REMOVE ODOUR , CHLORINE , MICROPOLLUTANTS AND DISSOLVED ORGANIC SUBSTANCES WHEN USED IN THE TREATMENT OF DRINKING AND INDUSTRIAL WATER .THE ACTIVATED CARBON SHALL ALSO MEET THE FOLLOWING REQUIREMENTS OF THIS STANDARD SPECIFICATION .

### **4. REQUIREMENTS**

#### **4.1 DEFINITIONS**

**APPROVED PRODUCTS :** THE APPROVED PRODUCTS ARE THOSE PRODUCTS WHOSE APPROVAL TEST SAMPLES ( SEE 5.1 ) HAVE BEEN LABORATORY TESTED AND HAVE PASSED THE APPROVAL TESTS SPECIFIED HEREIN ( SEE 5 ) AND HAVE BEEN LISTED ON OR APPROVED FOR BEING LISTED AS APPROVED SAMPLES .

**APPROVED SUPPLIERS :** THE SUPPLIERS AND/OR MANUFACTURER OF APPROVED PRODUCTS WILL BE KNOWN AS APPROVED SUPPLIERS .

**ACCEPTED PRODUCTS :** THE ACCEPTED PRODUCTS ARE THOSE PRODUCTS WHICH HAVE PASSED THE APPROVAL TESTS AS WELL AS ACCEPTANCE OPERATIONAL TEST ( SEE 6 ) .

**QUALIFIED PRODUCTS :** THE QUALIFIED PRODUCTS MEAN THE ACCEPTED PRODUCTS PROPOSED WITH RESPECT TO THIS STANDARD SPECIFICATION WHICH MEET ALL REQUIREMENTS OF THIS STANDARD SPECIFICATION .

**QUALIFIED SUPPLIER ( S ) : THE SUPPLIER AND / OR MANUFACTURER OF QUALIFIED PRODUCTS WILL BE KNOWN AS THE QUALIFIED SUPPLIER ( S ).**

**FINAL SUPPLIER : THE SUCCESSFUL BIDDER IS KNOWN AS THE FINAL SUPPLIER.**

## **4.2 PHYSICAL AND CHEMICAL CHARACTERISTICS**

### **4.2.1 PROPERTIES**

**THE ACTIVATED CARBON SHALL CONFORM TO THE PROPERTIES GIVEN IN TABLE 1 WHEN TESTED AS SPECIFIED.**

**TABLE 1**

<b>PROPERTIES</b>	<b>UNITS</b>	<b>VALUES</b>	<b>TEST METHODS</b>
<b>PARTICLE SIZE 1.40 x 0.425 mm ( 14 x 40 U.S. SIEVE SERIES )</b>	<b>WEIGHT %</b>	<b>90 – 100</b>	<b>ASTM D 2862</b>
<b>LARGER THAN 1.40 mm ( 14 mesh )</b>	<b>WEIGHT %</b>	<b>15</b>	<b>ASTM D 2862</b>
<b>SMALLER THAN 0.425 mm ( 40 mesh )</b>	<b>WEIGHT%</b>	<b>5</b>	<b>ASTM D 2862</b>
<b>MEAN PARTICLE DIAMETER</b>	<b>mm</b>	<b>0.9 – 1.1</b>	<b>ASTM D 2862</b>
<b>SPECIFIC SURFACE AREA , MIN .</b>	<b>m<sup>2</sup> / g</b>	<b>1000</b>	<b>ASTM D 4820</b>
<b>IODINE ADSORPTION , MIN .</b>	<b>mg/1g</b>	<b>900</b>	<b>ASTM D 4607</b>
	<b>CARBON</b>		<b>ORAWWA B604</b>
<b>PHENOL ADSORPTION , MIN .</b>	<b>%</b>	<b>6</b>	<b>DIN 19603</b>
<b>BALL PAN HARDNESS , MIN .</b>	<b>%</b>	<b>92</b>	<b>ASTM D 3802</b>
<b>MOISTURE CONTENT , MAX .</b>	<b>%</b>	<b>2</b>	<b>ASTM D 2867</b>
<b>IMPURITIES ( SEE 4.2.2 )</b>	<b>%</b>		<b>-</b>

### **4.2.2 IMPURITIES**

**THE GRANULAR ACTIVATED CARBON SHALL CONTAIN NO SOLUBLE INORGANIC OR ORGANIC SUBSTANCES IN QUANTITIES CAPABLE OF PRODUCING DELETERIOUS OR INJURIOUS EFFECTS**

UPON THE HEALTH OF THOSE CONSUMING THE WATER OR THAT WOULD OTHERWISE RENDER THE WATER THAT HAS BEEN TREATED PROPERLY WITH ACTIVATED CARBON UNFIT FOR PUBLIC USE . THE CARBON SHALL MEET THE REQUIREMENTS OF BS 6920 : PART 1 .

#### 4.3 FORMULATION CHANGES

THE PRESENTED MATERIAL(S) FOR SUPPLY SHALL BE ACCEPTED ONLY FOR THE FORMULATION FOR WHICH APPROVAL AND ACCEPTANCE OPERATIONAL TESTS ARE MADE . ANY CHANGE(S) IN FORMULATION , SHALL CAUSE FOR DESIGNATING THE MATERIAL AS A NEW MATERIAL WHICH SHALL NOT BE CONSIDERED ACCEPTED . THE MANUFACTURER MAY SUBMIT THE MODIFIED MATERIAL FOR ACCEPTANCE UNDER THIS STANDARD SPECIFICATION , USING A NEW MANUFACTURER'S DESIGNATION .

### 5. APPROVAL TESTS

APPROVAL TESTS ARE THE LABORATORY TESTS PERFORMED ON THE SAMPLE(S) SUBMITTED FOR APPROVAL .

THE APPROVAL TESTS OF ACTIVATED CARBON WILL CONSIST OF THE TESTS SPECIFIED IN TABLE 1 AS WELL AS ADSORPTIVE CAPACITY IN ACCORDANCE WITH ASTM D 3860 .

NOTE : THE ABSORBABLE CONSTITUENT OF WATER SAMPLE MAY BE CHLORINE ONLY .

#### 5.1 APPROVAL TEST SAMPLES

5.1.1 APPROVAL TEST SAMPLE(S) SHALL CONSIST OF SUFFICIENT AMOUNT OF



ACTIVATED CARBON FURNISHED  
 UNDER THIS  
 STANDARD SPECIFICATION . SAMPLE(S)  
 SHALL BE FORWARDED TO THE  
 PURCHASER . SAMPLE ( S ) SHALL BE  
 PLAINLY IDENTIFIED BY SECURELY  
 ATTACHED DURABLE TAGS OR LABELS  
 MARKED WITH FOLLOWING  
 INFORMATION :

- SAMPLE FOR QUALIFICATION TESTS ( OR APPROVAL TESTS )
- BRAND NAME
- NAME OF PRODUCTION PLANT ( PLANT WHERE ACTIVATED  
 CARBON IS MASS PRODUCED )
- MATERIAL DESIGNATION ( PRODUCT  
 REF/CODE )
- DATE OF PRODUCTION

5.1.2 THE SUPPLIER AND/OR MANUFACTURER SHALL ALSO PROVIDE  
 THE OPERATIONAL INFORMATION WITH EACH SAMPLE AS  
 FOLLOWS :

- DESCRIPTION AND FUNCTION ( S )
- OPERATIONAL INSTRUCTION WITH REFERENCE TO  
 ATTACHED
- APPENDIX ( DATA SHEET )
- HANDLING
- STORAGING
- OTHERS

## 6. ACCEPTANCE OPERATIONAL SAMPLES

THE APPEOVED PRODUCT(S) WHICH MEET SUBCLAUSE 4.1 SHALL BE TESTED  
 FOR OPERATING PERFORMANCE IN ACCORDANCE WITH ASTM D 3922 .

## 7. PRODUCTION TESTS

PRODUCTION TESTS ARE THE ONES NORMALLY PERFORMED BY THE PRODUCER ON SAMPLES TAKEN FROM PRODUCTION RUN DURING THE PRODUCTION OF MATERIAL ACCORDING TO ITS OWN QUALITY STANDARD. THE MANUFACTURER SHALL PROVIDE THE PRODUCTION TESTS REPORTS TO THE MENTIONED STANDARD.

## **8. QUALITY ASSURANCE**

THE SUPPLIER SHALL PROVIDE A QUALITY ASSURANCE CERTIFICATE TO ENSURE THAT THE ACTIVATED CARBON PROPOSED COMPLIES WITH THIS STANDARD SPECIFICATION.

## **9. INSPECTION AND QUALITY ASSURANCE ( QA )**

- THE MANUFACTURER AND/OR SUPPLIER SHALL BE RESPONSIBLE FOR CARRYING OUT ALL THE TESTS AND QA'S REQUIRED BY THIS STANDARD SPECIFICATION ( SEE 5 ) , USING HIS OWN OR OTHER RELIABLE FACILITIES , AND HE SHALL MAINTAIN COMPLETE RECORDS OF ALL SUCH TESTS AND QUALIFICATIONS. SUCH RECORDS SHALL BE AVAILABLE FOR REVIEW BY THE PURCHASER . THE MANUFACTURER AND / OR SUPPLIER SHALL FURNISH TO THE PURCHASER A CERTIFICATE OF QUALITY STATING THAT EACH LOT HAS BEEN SAMPLED , TESTED , AND QUALIFIED IN ACCORDANCE WITH THIS STANDARD SPECIFICATION AND HAS BEEN FOUND TO MEET THE REQUIREMENTS SPECIFIED .

- AN INSPECTION LOT SHALL CONSIST OF A BATCH ( OR BATCHES ) OF PRODUCTION PROCESSED FROM THE SAME MATERIAL COMPONENTS , AND OFFERED FOR INSPECTION AT ONE TIME .

- THE MANUFACTURER AND/OR SUPPLIER SHALL AFFORD THE PURCHASER'S INSPECTOR ALL REASONABLE FACILITIES REQUIRED FOR INSPECTION OF EACH BATCH OF PRODUCTION IN ACCORDANCE WITH THIS STANDARD SPECIFICATION . SUCH INSPECTION IN NO WAY RELIEVES THE

MANUFACTURER AND/OR SUPPLIER OF HIS RESPONSIBILITIES UNDER THE TERM OF THIS STANDARD SPECIFICATION .

- THE PURCHASER RESERVES THE RIGHT TO PERFORM ANY INSPECTIONS SET FORTH IN THIS STANDARD SPECIFICATION WHERE SUCH INSPECTIONS ARE DEEMED NECESSARY TO ASSURE THAT SUPPLIES AND SERVICES CONFORM TO THE PRESCRIBED REQUIREMENTS .

- THE PURCHASER'S INSPECTOR RESERVE THE RIGHT TO HAVE ACCESS TO THE MATERIALS SUBJECT TO INSPECTION FOR THE PURPOSE OF WITNESSING SELECTION OF THE SAMPLES , PREPARATION OF THE TEST SAMPLES AND PERFORMANCE OF THE TEST ( S ) . FOR SUCH TESTS , THE INSPECTOR RESERVES THE RIGHT TO INDICATE THE SAMPLE(S) FROM WHICH THE QUANTITIES WILL BE TAKEN IN ACCORDANCE WITH THE PROVISIONS OF THIS STANDARD SPECIFICATION .

## **10.PACKAGING**

THE ACTIVATED CARBON SHALL BE SUITABLY PACKAGED IN APPROXIMATELY 25 kg AIRTIGHT MULTIPLY PAPER BAGS WITH POLYETHYLENE LINING AND PROTECTED AGAINST ALL DAMAGES OR DEFECTS WHICH MAY OCCUR DURING HANDLING AND SEAWORTHY SHIPMENT .

## **11.MARKING**

### **11.1 MARKING OF CONTAINERS**

EACH CONTAINER SHALL BE LEGIBLY MARKED AT LEAST WITH FOLLOWING INFORMATION :

MANUFACTURER'S NAME AND ADDRESS

PURCHASER'S NAME AND ADDRESS

STANDARD SPECIFICATION : ( IGS-MS-CH-032- 2000 )

MESC NO.

HANDLING GUIDELINES

STORAGING SYMBOLS

DATE OF MANUFACTURE

BATCH NO.

## 11.2 INSTRUCTION

SUPPLIER SHALL PROVIDE COMPLETE SETS OF INSTRUCTIONS FOR USE.

# APPENDIX ( DATA SHEET ) FILTERING SYSTEM

## 1. FILTERS CHARACTERISTICS

### 1.1 DIMENSIONS OF FILTERS

- BED DIAMETER : 182.88 cm ( 72 in )
- BED HEIGHT : 152.4 cm ( 60 in )
- NUMBER OF FILTERS : 6 ( 4 FOR SERVICE AND 2 AS STAND BY )

### 1.2 QUANTATIVE DATA

#### 1.2.1 ACTIVATED CARBON ( FOR EACH OF FILTERS )

- WEIGHT : 1062 kg ( 2240 lb )
- VOLUME : 2.2 m<sup>3</sup> ( 78 cu ft )

#### 1.2.2 SAND LAYER THAT PUT UNDER ACTIVATED CARBON

- PARTICLE SIZES : 0.159 cm  
AND 0.318 cm  
( 1/16 in AND 1/8 in )
- WEIGHT : 1407 kg ( 3100 lb )
- VOLUME : 0.88 m<sup>3</sup> ( 31 cu ft )

#### 1.2.3 HEIGHT OF ABOVE EMPTY PART OF EACH OF FILTERS : 55.88 cm ( 22 in )

## 2. DESIGNE DATA

- PRESSURE : 6.9 bar

- **TEMPERATURE : 48°C**
- **CAPACITY ( FOR EACH OF FILTERS ) : 865 m<sup>3</sup>/D**
- **MAXIMUM CAPACITY ( FOR EACH OF FILTERS ) : 1199 m<sup>3</sup>/D**
- **TOTAL CAPACITY : 3460 m<sup>3</sup>/D**
- **NORMAL BACK WASH CYCLE TIMING : EVERY 6 DAYS**
- **TIME OF BACK WASHING : 12 MINUTES**
- **DIFFERENTIAL PRESSURE FOR ALARM : 0.86 bar**