



Standard Specification for Tracking and Traceability Encoding System of Natural Gas Distribution Components (Pipe, Tubing, Fittings, Valves, and Appurtenances)¹

This standard is issued under the fixed designation F2897; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification defines requirements for the data used in the tracking and traceability base-62 encoding system and the format of the resultant code to characterize various components used in fuel gas piping systems.

1.2 The final output of this specification is a 16 digit alpha-numeric code that defines a standardized approach or methodology for encoding certain characteristics of components that have been established based on consensus recommendations from the respective stakeholder group members. The means of marking or affixing the code to the components, and the means of reading and/or transferring the data or codes are outside the scope of this specification.

NOTE 1—To facilitate compliance with this specification, a web based application has been developed to manage and maintain unique manufacturer identification numbers. The URL for the website is: <http://www.componentid.org>.

1.3 The web based application is only intended to serve as a useful resource for managing the respective manufacturer identification numbers, codes, and other identifiers as per this specification. Any changes to the contents of the web based application are contingent upon subsequent changes to this specification. This specification shall have primacy.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

¹ This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.60 on Gas.

Current edition approved Nov. 1, 2021. Published February 2021. Originally approved in 2011. Last previous edition approved in 2015 as F2897–15a. DOI: 10.1520/F2897–21

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[A53/A53M Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless](#)

[A106/A106M Specification for Seamless Carbon Steel Pipe for High-Temperature Service](#)

[D1600 Terminology for Abbreviated Terms Relating to Plastics](#)

[D2513 Specification for Polyethylene \(PE\) Gas Pressure Pipe, Tubing, and Fittings](#)

[F412 Terminology Relating to Plastic Piping Systems](#)

2.2 *API Standards:*³

[API 5L Specification for Line Pipe](#)

2.3 *ANSI Standards:*⁴

[B31.8 Gas Transmission and Distribution Piping System](#)

[B1.20.1 1983 Pipe Threads, General Purpose, Inch](#)

[B109.1 Diaphragm-Type Gas Displacement Meters \(Under 500 Cubic-foot-per-hour Capacity\)](#)

[B109.2 Diaphragm-Type Gas Displacement Meters \(500 Cubic-foot-per-hour Capacity\)](#)

[B109.3 Rotary Type Gas Displacement Meters](#)

[B109.4 Self-Operated Diaphragm Type Natural Gas Service Regulators](#)

2.4 *CFR Standards:*⁵

[49 CFR Part 192 Pipeline Safety Requirements](#)

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F412, and abbreviations are in accordance with Terminology D1600, unless otherwise specified.

3.2 The gas industry terminology used in this specification is in accordance with ANSI B31.8 or 49 CFR Part 192, unless otherwise indicated.

3.3 *character, n*—an integer from zero (0) to nine (9) or a letter that is upper case and/or lower case from a to z or A to Z.

³ Available from American Petroleum Institute (API), 1220 L. St., NW, Washington, DC 20005-4070, <http://www.api.org>.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁵ Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, <http://www.gpo.gov>.

*A Summary of Changes section appears at the end of this standard

3.4 *component, n*—pipe, tubing, fittings, valves, and appurtenances unless specifically stated otherwise.

3.5 *digit, n*—an integer from zero (0) to nine (9).

3.6 *FPT, n*—internal taper thread as defined under ANSI/ASME B1.20.1, or commonly referred to as “female pipe thread”.

3.7 *MPT, n*—external taper thread as defined under ANSI/ASME B1.20.1, or commonly referred to as “male pipe thread”.

3.8 *traceability, n*—identify the origin of materials and parts used to manufacturer a given component; and/or the product processing or manufacturing history.

3.9 *tracking, v*—knowing, documenting, and/or collecting information related to the distribution and location of a given component after delivery from the manufacturer or supplier.

4. Gas Distribution Component Traceability Identifier

4.1 *General*—The gas distribution component traceability identifier shall be comprised of sixteen (16) alphanumeric characters that specify respective attributes (data set) for a given component.

4.1.1 The specified number of characters and order for each data set shall conform to **Table 1**.

4.1.2 The specified number of characters shall be developed using the base-62 encoding system per section 4.9 and the initial input data requirements per Section 5.

4.1.3 The gas distribution component traceability identifier shall be in a format suitable for downloading the character codes into database systems owned and maintained by the end user.

NOTE 2—An illustrative example is provided in **Appendix X2**.

4.2 *Identification of Component Manufacturer*—Each component manufacturer shall be identified by a unique two character code which shall be assigned after completing the required registration and activated by the webmaster of the website <http://www.componentid.org>. The manufacturer identification code shall be unique to that particular company and can only be used by that respective manufacturer/supplier.

4.3 *Identification of Component Manufacturer’s Lot Code*—The component manufacturer’s lot code shall be identified by a four character code that is developed using the base-62 encoding system per 4.9. The four character code shall be

unique in a manner to help ascertain information related to the origin of materials, product processing history, and other information that is agreed upon between the manufacturer and end user.

4.4 *Identification of Component Production Date*—The production date code shall be identified by a three character code that is developed using the base-62 encoding system per 4.9.

4.5 *Identification of Component Material*—The primary material used to manufacture the pipe or component shall be identified by a single character code per 5.4.

4.6 *Identification of Component Type*—Each component type shall be identified by a two character code per 5.5.

4.7 *Identification of Component Size*—Each component size shall be identified by a three character code that is developed using the sizing calculation outlined in 5.6 and the base-62 encoding system per 4.9.

4.8 *Identification of Base 62 Index*—Each component type shall be identified by a single character code per 5.7.

4.9 *Base-62 Encoding System:*

4.9.1 The base-62 positional encoding system shall utilize integer values between zero and nine and both uppercase and lowercase alphabet characters with the assigned place values as shown in **Table 2**.

TABLE 2 Positional Values for Base-62 Encoding System

Positional Value	Character	Positional Value	Character
0	0	36	A
1	1	37	B
2	2	38	C
3	3	39	D
4	4	40	E
5	5	41	F
6	6	42	G
7	7	43	H
8	8	44	I
9	9	45	J
10	a	46	K
11	b	47	L
12	c	48	M
13	d	49	N
14	e	50	O
15	f	51	P
16	g	52	Q
17	h	53	R
18	i	54	S
19	j	55	T
20	k	56	U
21	l	57	V
22	m	58	W
23	n	59	X
24	o	60	Y
25	p	61	Z
26	q		
27	r		
28	s		
29	t		
30	u		
31	v		
32	w		
33	x		
34	y		
35	z		

TABLE 1 Specified Number of Characters and Order for Gas Distribution Component Traceability Identifier

Data	Number of Character(s) ^A
Component manufacturer	2
Component manufacturer’s lot code	4
Component production date	3
Component material	1
Component type	2
Component size	3
Base 62 Index	1

^A The total number of characters is based on the final resultant after applying the base-62 encoding system in this specification. For different initial input data, the requirements and format are in Section 5 of this specification.

4.9.2 The assigned place values shown in **Table 2** shall be used to convert the initial input data into the final alphanumeric code.

NOTE 3—Detailed examples of converting an initial integer string to a corresponding base-62 alphanumeric character string and vice-versa can be found in **Appendix X1**.

NOTE 4—The positional value is the value corresponding to the respective character. For example, the positional value corresponding to the character “r” is 27. The positional value corresponding to the character “T” is 55.

5. Input Data String

5.1 *Component Manufacturer*—Each component manufacturer shall establish a unique two (2) digit identifier by completing the required registration and activated by the webmaster of the website <http://www.componentid.org>. The manufacturer identification code shall be unique to that particular company and can only be used by that company. In cases where the company undergoes a change in name, acquired, merged with another company, new two (2) digit identifier must be registered and activated if the “acquiring” or “merged with” company does not already have a registered identifier.

5.2 *Component Manufacturer’s Lot Code*—Each component manufacturer shall establish a unique seven (7) digit number for their lot code which shall be used as the input into the base-62 encoding system per 4.9. The 7 digit number shall consist of only integer values and cannot contain any other characters such as alphabetic or ASCII characters.

NOTE 5—The 7 digit code can be developed freely by the manufacturer to define individual production lots in a unique way. Elements of the 7 digit code may possibly include production site, extrusion line, injection molding equipment number, operator, shift, etc. The 7 digit code should be capable of providing pertinent traceability information upon request.

5.3 *Component Production Date*—Each component manufacturer shall provide the production date of the respective component consisting of five (5) digits as input into the base-62 encoding system per 4.9.

5.3.1 The first three digits shall correspond to the particular day of the year.

5.3.2 The final two digits shall correspond to the last two digits of the year.

NOTE 6—For example, the date input represented by 23410 implies the 234th day of 2010.

5.4 *Component Material*—Each component manufacturer shall assign a single character code for the primary material used to manufacture the respective component from **Table 3**.

NOTE 7—Additional material code numbers are reserved for future use and will be activated upon revision of this specification.

NOTE 8—The “Grade” designation for steel materials will vary based on the standard to which it is manufactured. The user should verify the chemical and mechanical properties in accordance to the specific standard that they are utilizing before making their final selection.

5.4.1 For pipe and tubing made from a single material, the code shall be assigned from the list shown in **Table 3**.

5.4.2 For multi-layer pipe and tubing, the inner most layer which is in contact with the natural gas shall be assigned from the list shown in **Table 3**.

TABLE 3 List of Material Types

Type	Code
PE2406	A
PE2708	B
PE3408	C
PE3608	D
PE3708	E
PE3710	F
PE4608	G
PE4710	H
Poly (Vinyl Chloride) – PVC	J
Polyamide 11 – PA11	K
Polyamide 12 – PA12	L
Steel	M
Stainless Steel	N
Cast Iron	O
Copper	P
Brass	Q
Malleable Iron	R
Ductile Iron	S
Reinforced Epoxy Resin	T
Nylon	U
Glass Filled Nylon	V
Other	X
Steel – GRADE A	0
Steel – GRADE B	1
Steel – GRADE C	2
Steel – GRADE X42	3
Steel – GRADE X46	4
Steel – GRADE X52	5
Steel – GRADE X56	6
Steel – GRADE X60	7
Steel – GRADE X65	8
Steel – GRADE X70	9

5.4.3 For factory assembled transition fittings and risers and transition tees intended to facilitate a change between metallic and non-metallic piping systems, the non-metallic portion shall be identified.

5.4.4 For all components other than factory assembled transition fittings and risers and transition tees, the material code shall correspond to the outer shell or body of the respective component regardless of the piping system to which it is intended to be installed.

5.4.5 For fittings intended to facilitate a change between PE to another thermoplastic piping systems, the material code shall correspond to the outer shell or body of the respective component connecting to the PE pipe.

NOTE 9—In previous editions of Specification **D2513** various thermoplastic materials were approved for use under CFR Part 192 requirements. For those other materials which have subsequently deleted but still allowed to be used for repair purposes only, for example, PVC, then PE will take precedence.

5.5 *Component Type*—Each component manufacturer shall assign a two (2) character code for their respective component type from **Table 4**.

NOTE 10—Additional component type code numbers are reserved for future use and will be activated upon revision of this specification.

5.6 *Component Size*—Each component manufacturer shall develop a unique dimensional code, *D*, corresponding to the size of the respective item. The dimensional code shall be used as input into the base-62 encoding system per 4.9.

5.6.1 The dimensional code shall be calculated using **Eq 1** based on the factors from **Tables 5-7** corresponding to the dimensions for a given component:

TABLE 4 List of Component Types

Category Type-General	Subcategory Type	Character	
Pipe	Other	10	
	Straight	11	
	Coiled	12	
	Casing	13	
	Seamless Line Pipe, API 5L, PSL1, Single Coat	1A	
	Seamless Line Pipe, API 5L, PSL1, Dual Coat	1B	
	Seamless Line Pipe, API 5L, PSL2, Single Coat	1C	
	Seamless Line Pipe, API 5L, PSL2, Dual Coat	1D	
	Electric Resistance Weld, API 5L, PSL1, Single Coat	1E	
	Electric Resistance Weld, API 5L, PSL1, Dual Coat	1F	
	Electric Resistance Weld, API 5L, PSL2, Single Coat	1G	
	Electric Resistance Weld, API 5L, PSL2, Dual Coat	1H	
	Seamless and Welded, ASTM A53/A53M	1J	
	Seamless Carbon Steel, ASTM A106/A106M	1K	
	Coupling	Other	20
Socket fusion		21	
Socket fusion with EFV		22	
Electrofusion		23	
Electrofusion with EFV		24	
Mechanical compression or nut follower		25	
Mechanical compression or nut follower with EFV		26	
Mechanical stab		27	
Mechanical stab with EFV		28	
Mechanical interference fit		29	
Mechanical interference fit with EFV		2A	
Welded		2B	
Threaded		2C	
Flanged		2D	
Adapter Coupling		Other	30
	Compression by male pipe thread	31	
	Compression by female pipe thread	32	
	Compression by butt fusion	33	
	Compression by butt welded	34	
	Compression by solvent welded	35	
	Compression by stab	39	
	Stab by male pipe thread	36	
	Stab by female pipe thread	37	
	Stab by solvent welded	38	
	End caps	Other	40
		Butt fusion	41
		Socket fusion	42
		Electrofusion	43
		Mechanical compression or nut follower	44
Mechanical stab		45	
Mechanical interference fit		46	
Welded		47	
Threaded		48	
Fabricated		49	
Elbows		Other	50
		Butt fusion 90	51
		Socket fusion 90	52
		Electrofusion 90	53
		Mechanical compression or nut follower 90	54
	Mechanical stab 90	55	
	Mechanical interference fit 90	56	
	Welded 90	57	
	Threaded 90	58	
	Fabricated 90	59	
	Butt fusion 45	5A	
	Socket fusion 45	5B	
	Electrofusion 45	5C	
	Mechanical compression or nut follower 45	5D	
	Mechanical stab 45	5E	
Mechanical interference fit 45	5F		
Welded 45	5G		
Threaded 45	5H		
Fabricated 45	5J		
3-way tees	Other	60	
	Butt fusion	61	
	Socket fusion	62	
	Electrofusion	63	
	Mechanical compression or nut follower	64	
	Mechanical stab	65	
	Mechanical interference fit	66	
Welded	67		

TABLE 4 *Continued*

Category	Type-General	Subcategory Type	Character	
Reducer		Threaded	68	
		Fabricated	69	
		Other	70	
		Butt fusion	71	
		Socket fusion	72	
		Electrofusion	73	
		Mechanical compression or nut follower	74	
		Mechanical stab	75	
		Mechanical interference fit	76	
		Welded	77	
Tapping tees		Threaded	78	
		Fabricated	79	
		Other	80	
		Saddle heat fusion by butt fusion outlet	81	
		Saddle heat fusion by butt fusion outlet with EFV	82	
		Saddle heat fusion by socket outlet	83	
		Saddle heat fusion by socket outlet with EFV	84	
		Saddle heat fusion by mechanical compression outlet	85	
		Saddle heat fusion by mechanical compression outlet with EFV	86	
		Saddle heat fusion by stab outlet	87	
		Saddle heat fusion by stab outlet with EFV	88	
		Electrofusion by butt fusion outlet	89	
		Electrofusion by butt fusion outlet with EFV	8A	
		Electrofusion by socket outlet	8B	
		Electrofusion by socket outlet with EFV	8C	
		Electrofusion by mechanical compression outlet	8D	
		Electrofusion by mechanical compression outlet with EFV	8E	
		Electrofusion by stab outlet	8F	
		Electrofusion by stab outlet with EFV	8G	
		Mechanical by butt fusion outlet	8H	
		Mechanical by butt fusion outlet with EFV	8J	
		Mechanical by socket outlet	8K	
		Mechanical by socket outlet with EFV	8L	
		Mechanical by mechanical compression outlet	8M	
		Mechanical by mechanical compression outlet with EFV	8N	
		Mechanical by stab outlet	8P	
		Mechanical by stab outlet with EFV	8Q	
		Mechanical by mechanical interference fit	8R	
	Mechanical by mechanical interference fit with EFV	8S		
High Volume Tapping Tees		Other	90	
		Electrofusion by butt fusion	91	
		Saddle heat fusion by butt fusion	92	
		Mechanical by compression outlet	93	
		Electrofusion by socket outlet	94	
		Saddle heat fusion by socket outlet	95	
		Mechanical by stab outlet	96	
		Mechanical by mechanical interference fit	97	
	Branch Saddle		Other	B0
			Electrofusion	B1
		Saddle heat fusion	B2	
		Mechanical	B3	
Mechanical saddle		No outlet	S1	
Service tee or Valve tee		Other	D0	
		Welded by welded	D1	
		Welded by butt fusion	D2	
		Welded by thread	D3	
		Welded by compression or nut follower	D4	
		Welded by mechanical interference fit	D5	
		Welded by stab	DD	
		Thread by welded	D6	
		Thread by compression or nut follower	D7	
		Thread by mechanical interference fit	DE	
		Thread by stab	DF	
		Thread by thread	DG	
		Thread by butt fusion	DH	
		Mechanical saddle by welded	D8	
		Mechanical saddle by Butt fusion	D9	
		Mechanical saddle by thread	DA	
		Mechanical saddle by compression or nut follower	DB	
		Mechanical saddle by mechanical interference fit	DC	
		Mechanical saddle by stab	DJ	
	Service saddles		Other	E0
			Single strap	E1
			Double strap	E2
	Transition Fitting		Other	T0

TABLE 4 Continued

Category	Type-General	Subcategory Type	Character	
Riser		Welded end	T1	
		Thread end	T2	
		Flanged end	T3	
		Other	R0	
		Factory Assembled, Anodeless	R1	
		Factory Assembled, Anodeless, Flexible	R2	
		Factory Assembled, Non-Anodeless	R3	
		Field Assembled, Anodeless	R4	
		Field Assembled, Anodeless, Flexible	R5	
		Field Assembled, Non-Anodeless	R6	
Valve		Other	V0	
		Ball valve	V1	
		Butterfly valve	V2	
		Check valve	V3	
		Relief valve	V4	
		Gate valve	V5	
		Needle valve	V6	
		Plug valve	V7	
	Excess Flow Valve		Excess flow valve	EF
			Other	M0
Meter set assembly and components		Diaphragm meter	M1	
		Rotary meter	M2	
		Meter set assembly	M3	
		Meter bar	M4	
		Meter swivel	M5	
		Meter nut	M6	
		Ultrasonic meter	M7	
		Turbine meter	M8	
		Remote shut off meter	M9	
		Other	RX	
Regulator		Pilot	RP	
		Service	RS	
		Relief	RR	
Filter		Other	F0	
		Pilot	F1	
		Service and mains	F2	
Anode		Strainer	F3	
		Other	A0	
		Cast iron	A1	
		Graphite	A2	
		Magnesium	A3	
		Zinc	A4	
Pressure control fitting		Other	P0	
		Split repair	P1	
		Bottom out	P2	
		Top tap	P3	
Union		Non-insulated	U1	
		Insulated	UX	
		Other	C0	
Repair clamp		Repair clamps	C1	

$$D = (C_1 * 378) + C_2 + 1 \quad (1)$$

where:

C_1 = factor corresponding to the first dimension, D_1 , and
 C_2 = factor corresponding to the second dimension, D_2 .

5.6.1.1 The second dimension, D_2 , shall always be the larger dimension for a given component as shown in Eq 2:

$$D_2 > D_1 \quad (2)$$

5.6.1.2 For the case of a pipe, tubing, or other in-line components where there is no dimensional change, then $D_1 = D_2$ and $C_1 = C_2$.

5.6.1.3 For components other than various risers and transition fittings or other using metallic parts, the second dimension, D_2 , shall be expressed by the connection to the main.

5.6.1.4 In the case of various types of risers and transition fittings or others using metallic parts, the second dimension, D_2 , shall be expressed by the metallic size, for example, MPT or FPT.

NOTE 11—For the case of a 2" IPS SDR9.33 pipe, $D_1 = D_2$ and $C_1 = C_2 = 37$. Then from Eq 1, the resulting value for $D = (37*378)+37+1 = 14024$.

NOTE 12—For the case of a 2" IPS SDR9.33 x 1/2" CTS 0.090 saddle fitting (electrofusion, molded saddle fusion, mechanical), $D_2 = 2$ " IPS with $C_2 = 37$; $D_1 = 1/2$ " CTS 0.090 with $C_1 = 4$. Then from Eq 1, the resulting value for $D = (4 * 378) + 37 + 1 = 1550$.

5.7 Base 62 Index—The sixteenth character shall be a single character code per Table 8.

5.7.1 Unless otherwise specified, the sixteenth character shall be a null value of "0".

TABLE 5 C1 and C2 Factors Corresponding to Standard Dimensions (D1 or D2) for CTS and IPS Sizes, in. (mm)

D1 or D2			Factor C1 or C2	D1 or D2			Factor C1 or C2
Diameter	SDR	Wall Thickness in. (mm)		Diameter	SDR	Wall Thickness in. (mm)	
¼ in. CTS	—	0.062 (1.58)	1	2 in. IPS	9.33	0.255 (6.48)	37
⅜ in. CTS	—	0.062 (1.58)	2	2 in. IPS	11	0.216 (5.59)	38
½ in. CTS	—	0.062 (1.58)	3	2 in. IPS	13.5	0.176 (4.47)	39
½ in. CTS	—	0.090 (2.27)	4	3 in. IPS	11	0.318 (8.08)	40
½ in. CTS	—	0.104 (2.64)	5	3 in. IPS	11.5	0.304 (7.72)	41
¾ in. CTS	—	0.062 (1.58)	6	3 in. IPS	13.5	0.259 (6.58)	42
¾ in. CTS	—	0.077 (1.95)	7	4 in. IPS	9.33	0.482 (12.24)	43
¾ in. CTS	—	0.090 (2.27)	8	4 in. IPS	11	0.409 (10.39)	44
1 in. CTS	—	0.062 (1.58)	9	4 in. IPS	11.5	0.391 (9.93)	45
1 in. CTS	—	0.090 (2.27)	10	4 in. IPS	13.5	0.333 (8.46)	46
1 in. CTS	—	0.099 (2.51)	11	4 in. IPS	15.5	0.290 (7.37)	47
1 in. CTS	—	0.101 (2.56)	12	4 in. IPS	17	0.265 (6.73)	48
1 in. CTS	—	0.121 (3.07)	13	6 in. IPS	11	0.602 (15.29)	49
1¼ in. CTS	—	0.062 (1.58)	14	6 in. IPS	11.5	0.576 (14.63)	50
1¼ in. CTS	—	0.090 (2.27)	15	6 in. IPS	13.5	0.491 (12.47)	51
1¼ in. CTS	—	0.121 (3.07)	16	6 in. IPS	17	0.390 (9.91)	52
1¾ in. CTS	—	0.062 (1.58)	17	6 in. IPS	21	0.315 (8.00)	53
½ in. IPS	9.33	0.090 (2.29)	18	8 in. IPS	11	0.784 (19.91)	54
½ in. IPS	11	0.076 (1.93)	19	8 in. IPS	11.5	0.750 (19.05)	55
¾ in. IPS	11	0.095 (2.41)	20	8 in. IPS	13.5	0.639 (16.23)	56
¾ in. IPS	D	0.090 (2.29)	21	8 in. IPS	17	0.507 (12.90)	57
1 in. IPS	9.33	0.140 (3.56)	22	8 in. IPS	21	0.411 (10.44)	58
1 in. IPS	9.9	0.133 (3.38)	23	10 in. IPS	11	0.977 (24.82)	59
1 in. IPS	11	0.120 (3.05)	24	10 in. IPS	11.5	0.935 (23.75)	60
1 in. IPS	13.5	0.097 (2.46)	25	10 in. IPS	13.5	0.796 (20.22)	61
1 in. IPS	D	0.090 (2.29)	26	10 in. IPS	17	0.632 (16.05)	62
1¼ in. IPS	9.33	0.178 (4.52)	27	10 in. IPS	21	0.512 (13.00)	63
1¼ in. IPS	10	0.166 (4.22)	28	12 in. IPS	11	1.159 (29.44)	64
1¼ in. IPS	11	0.151 (3.84)	29	12 in. IPS	11.5	1.109 (28.17)	65
1¼ in. IPS	13.5	0.123 (3.12)	30	12 in. IPS	13.5	0.944 (23.98)	66
1¼ in. IPS	17	0.098 (2.49)	31	12 in. IPS	17	0.750 (19.05)	67
1¼ in. IPS	D	0.090 (2.29)	32	12 in. IPS	21	0.607 (15.42)	68
1½ in. IPS	11	0.173 (4.39)	33	14 in. IPS	11	1.273 (32.33)	69
1½ in. IPS	13.5	0.141 (3.58)	34	14 in. IPS	13.5	1.037 (26.34)	70
1½ in. IPS	17	0.112 (2.85)	35	14 in. IPS	17	0.824 (20.93)	71
1½ in. IPS	D	0.090 (2.29)	36	14 in. IPS	21	0.667 (16.94)	72
				16 in. IPS	11	1.455 (36.96)	73
				16 in. IPS	13.5	1.185 (30.10)	74
				16 in. IPS	17	0.941 (23.90)	75
				16 in. IPS	21	0.762 (19.35)	76
				18 in. IPS	11	1.636 (41.55)	77
				18 in. IPS	13.5	1.333 (33.86)	78
				18 in. IPS	17	1.059 (26.90)	79
				18 in. IPS	21	0.857 (21.77)	80
				20 in. IPS	11	1.818 (46.18)	81
				20 in. IPS	13.5	1.481 (37.62)	82
				20 in. IPS	17	1.176 (29.87)	83
				20 in. IPS	21	0.952 (24.18)	84
				22 in. IPS	11	2.000 (50.8)	85
				22 in. IPS	13.5	1.630 (41.40)	86
				22 in. IPS	17	1.294 (32.87)	87
				22 in. IPS	21	1.048 (26.62)	88
				24 in. IPS	11	2.182 (55.43)	89
				24 in. IPS	13.5	1.778 (45.16)	90
				24 in. IPS	17	1.412 (35.86)	91
				24 in. IPS	21	1.143 (29.03)	92

6. Keywords

6.1 base-62 encoding system; component; gas distribution; marking; pipe; traceability; tracking