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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.

NOTE 2—Meters and regulators are excluded from this specification because traceability marking requirements for these products are defined in ANSI B109.1–B109.4.

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.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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-feet-per-hour Capacity)

B109.2 Diaphragm-Type Gas Displacement Meters (500 Cubic-feet-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.

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

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

[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.

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[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.

[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 the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402.

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

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 3—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.

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.

4.4 *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.

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 4—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.

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		

NOTE 5—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 "aquiring" 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 6—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 7—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 8—Additional material code numbers are reserved for future use and will be activated upon revision of this specification.

NOTE 9—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.

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 10—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.

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

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

NOTE 11—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:

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

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:

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, API5L, 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
	Threaded	68
	Fabricated	69
Reducer	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
	Threaded	78
	Fabricated	79
Tapping tees	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
	Welded end	T1
	Thread end	T2
	Flanged end	T3
Riser	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
Meter set assembly and components	Other	M0
	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
Regulator	Other	RX
	Pilot	RP
	Service	RS
	Relief	RR
Filter	Other	F0
	Pilot	F1
	Service and mains	F2
	Strainer	F3
Anode	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

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

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 12—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 13—For the case of a 2" IPS SDR9.33 × ½ " CTS 0.090 saddle fitting (electrofusion, molded saddle fusion, mechanical), D_2 = 2" IPS with $C_2 = 37$; D_1 = ½ " 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".

6. Keywords

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

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 ″ CTS	—	0.062 (1.58)	1	2” IPS	9.33	0.255 (6.48)	37
⅜ ″ CTS	—	0.062 (1.58)	2	2″ IPS	11	0.216 (5.59)	38
½ ″ CTS	—	0.062 (1.58)	3	2″ IPS	13.5	0.176 (4.47)	39
½ ″ CTS	—	0.090 (2.27)	4	3″ IPS	11	0.318 (8.08)	40
½ ″ CTS	—	0.104 (2.64)	5	3″ IPS	11.5	0.304 (7.72)	41
¾ ″ CTS	—	0.062 (1.58)	6	3″ IPS	13.5	0.259 (6.58)	42
¾ ″ CTS	—	0.077 (1.95)	7	4″ IPS	9.33	0.482 (12.24)	43
¾ ″ CTS	—	0.090 (2.27)	8	4″ IPS	11	0.409 (10.39)	44
1″ CTS	—	0.062 (1.58)	9	4″ IPS	11.5	0.391 (9.93)	45
1″ CTS	—	0.090 (2.27)	10	4″ IPS	13.5	0.333 (8.46)	46
1″ CTS	—	0.099 (2.51)	11	4” IPS	15.5	0.290 (7.37)	47
1″ CTS	—	0.101 (2.56)	12	4″ IPS	17	0.265 (6.73)	48
1″ CTS	—	0.121 (3.07)	13	6″ IPS	11	0.602 (15.29)	49
1¼ ″ CTS	—	0.062 (1.58)	14	6″ IPS	11.5	0.576 (14.63)	50
1¼ ″ CTS	—	0.090 (2.27)	15	6″ IPS	13.5	0.491 (12.47)	51
1¼ ″ CTS	—	0.121 (3.07)	16	6″ IPS	17	0.390 (9.91)	52
1¾ ″ CTS	—	0.062 (1.58)	17	6″ IPS	21	0.315 (8.00)	53
½ ″ IPS	9.3	0.090 (2.29)	18	8″ IPS	11	0.784 (19.91)	54
½ ″ IPS	11	0.076 (1.93)	19	8″ IPS	11.5	0.750 (19.05)	55
¾ ″ IPS	11	0.095 (2.41)	20	8″ IPS	13.5	0.639 (16.23)	56
¾ ″ IPS	D	0.090 (2.29)	21	8″ IPS	17	0.507 (12.90)	57
1″ IPS	9.33	0.140 (3.56)	22	8″ IPS	21	0.411 (10.44)	58
1″ IPS	9.9	0.133 (3.38)	23	10″ IPS	11	0.977 (24.82)	59
1″ IPS	11	0.120 (3.05)	24	10″ IPS	11.5	0.935 (23.75)	60
1″ IPS	13.5	0.097 (2.46)	25	10″ IPS	13.5	0.796 (20.22)	61
1″ IPS	D	0.090 (2.29)	26	10″ IPS	17	0.632 (16.05)	62
1¼ ″ IPS	9.33	0.178 (4.52)	27	10″ IPS	21	0.512 (13.00)	63
1¼ ″ IPS	10	0.166 (4.22)	28	12″ IPS	11	1.159 (29.44)	64
1¼ ″ IPS	11	0.151 (3.84)	29	12″ IPS	11.5	1.109 (28.17)	65
1¼ ″ IPS	13.5	0.123 (3.12)	30	12″ IPS	13.5	0.944 (23.98)	66
1¼ ″ IPS	17	0.098 (2.49)	31	12″ IPS	17	0.750 (19.05)	67
1¼ ″ IPS	D	0.090 (2.29)	32	12″ IPS	21	0.607 (15.42)	68
1½ ″ IPS	11	0.173 (4.39)	33	14” IPS	11	1.273 (32.33)	69
1½ ″ IPS	13.5	0.141 (3.58)	34	14” IPS	13.5	1.037 (26.34)	70
1½ ″ IPS	17	0.112 (2.85)	35	14” IPS	17	0.824 (20.93)	71
1½ ″ IPS	D	0.090 (2.29)	36	14” IPS	21	0.667 (16.94)	72
				16” IPS	11	1.455 (36.96)	73
				16” IPS	13.5	1.185 (30.10)	74
				16” IPS	17	0.941 (23.90)	75
				16” IPS	21	0.762 (19.35)	76
				18” IPS	11	1.636 (41.55)	77
				18” IPS	13.5	1.333 (33.86)	78
				18” IPS	17	1.059 (26.90)	79
				18” IPS	21	0.857 (21.77)	80
				20” IPS	11	1.818 (46.18)	81
				20” IPS	13.5	1.481 (37.62)	82
				20” IPS	17	1.176 (29.87)	83
				20” IPS	21	0.952 (24.18)	84
				22” IPS	11	2.000 (50.8)	85
				22” IPS	13.5	1.630 (41.40)	86
				22” IPS	17	1.294 (32.87)	87
				22” IPS	21	1.048 (26.62)	88
				24” IPS	11	2.182 (55.43)	89
				24” IPS	13.5	1.778 (45.16)	90
				24” IPS	17	1.412 (35.86)	91
				24” IPS	21	1.143 (29.03)	92

TABLE 6 C1 and C2 Factors Corresponding to Dimensions (D1 or D2) for MPT and FPT Sizes

D1 or D2	Factor C1 or C2	D1 or D2	Factor C1 or C2
½ " MPT	101	½ " FPT	121
¾ " MPT	102	¾ " FPT	122
1" MPT	103	1" FPT	123
1¼ " MPT	104	1¼ " FPT	124
1½ " MPT	105	1½ " FPT	125
2" MPT	106	2" FPT	126
3" MPT	107	3" FPT	127
4" MPT	108	4" FPT	128
6" MPT	109	6" FPT	129
8" MPT	110	8" FPT	130
10" MPT	111	10" FPT	131
12" MPT	112	12" FPT	132

TABLE 7 C1 and C2 Factors Corresponding to Dimensions (D1 or D2) for Steel NPS Sizes

NPS Designator	Specified Wall Thickness, in. (mm)	Factor C1 or C2
⅛ ”	0.068 (1.73)	151
	0.095 (2.41)	152
¼ ”	0.088 (2.24)	153
	0.119 (3.02)	154
⅜ ”	0.091 (2.31)	155
	0.126 (3.20)	156
½ ”	0.109 (2.77)	157
	0.147 (3.73)	158
¾ ”	0.113 (2.87)	159
	0.154 (3.91)	160
1”	0.133 (2.87)	161
	0.179 (4.55)	162
1¼ ”	0.140 (3.56)	163
	0.191 (4.85)	164
1½ ”	0.145 (3.68)	165
2”	0.154 (3.91)	167
	0.218 (5.54)	168
3	0.188 (4.78)	169
	0.216 (5.49)	170
4	0.156 (3.91)	171
	0.188 (4.78)	172
	0.237 (6.02)	173
6	0.188 (4.78)	175
	0.219 (5.56)	176
	0.250 (6.35)	177
	0.280 (7.11)	178
8	0.188 (4.78)	181
	0.219 (5.56)	182
	0.250 (6.35)	183
	0.322 (8.18)	184
10	0.188 (4.78)	187
	0.203 (5.16)	188
	0.219 (5.56)	189
	0.279 (7.09)	190
	0.365 (9.27)	191
12	0.219 (5.56)	193
	0.250 (6.35)	194
	0.312 (7.92)	195
	0.375 (9.52)	196
14	0.209 (5.30)	197
	0.250 (6.35)	198
	0.375 (9.53)	199
	0.625 (15.88)	200
	0.687 (17.45)	201
	0.938 (23.83)	202
15	0.209 (5.30)	203
	0.250 (6.35)	204
16	0.188 (4.78)	205
	0.219 (5.56)	206
	0.225 (5.72)	207
	0.243 (6.17)	208
	0.250 (6.35)	209
	0.260 (6.60)	210
	0.270 (6.86)	211
	0.280 (7.11)	212
	0.312 (7.93)	213
	0.325 (8.26)	214

TABLE 7 *Continued*

NPS Designator	Specified Wall Thickness, in. (mm)	Factor C1 or C2
	0.345 (8.76)	215
	0.357 (9.07)	216
	0.365 (9.27)	217
	0.375 (9.53)	218
	0.406 (10.31)	219
	0.500 (12.70)	220
	0.530 (13.46)	221
	0.550 (13.97)	222
	0.560 (14.22)	223
	0.625 (15.88)	224
	0.656 (16.66)	225
	0.843 (21.41)	226
	1.039 (26.39)	227
	1.125 (28.58)	228
	1.218 (30.94)	229
	1.438 (36.53)	230
	1.594 (40.49)	231
18	0.219 (5.56)	232
	0.250 (6.35)	233
	0.312 (7.93)	234
	0.344 (8.73)	235
	0.375 (9.53)	236
	0.406 (10.31)	237
	0.500 (12.70)	238
	0.750 (19.05)	239
	0.938 (23.83)	240
	1.125 (28.58)	241
	1.156 (29.36)	242
	1.375 (34.93)	243
	2.100 (53.34)	244
20	0.219 (5.56)	245
	0.234 (5.94)	246
	0.250 (6.35)	247
	0.265 (6.73)	248
	0.281 (7.14)	249
	0.288 (7.32)	250
	0.312 (7.93)	251
	0.328 (8.33)	252
	0.344 (8.74)	253
	0.375 (9.53)	254
	0.406 (10.31)	255
	0.438 (11.13)	256
	0.469 (11.91)	257
	0.500 (12.70)	258
22	0.219 (5.56)	259
	0.237 (6.02)	260
	0.250 (6.35)	261
	0.281 (7.14)	262
	0.312 (7.93)	263
	0.344 (8.74)	264
	0.371 (9.42)	265
	0.375 (9.53)	266
	0.432 (10.97)	267
	0.438 (11.13)	268
	0.500 (12.70)	269
	0.562 (14.28)	270
	0.625 (15.88)	271
24	0.250 (6.35)	272
	0.265 (6.73)	273
	0.271 (6.88)	274
	0.281 (7.14)	275
	0.289 (7.34)	276
	0.307 (7.80)	277
	0.312 (7.93)	278
	0.320 (8.13)	279
	0.344 (8.74)	280
	0.375 (9.53)	281
	0.382 (9.70)	282
	0.391 (9.93)	283
	0.406 (10.31)	284

TABLE 7 *Continued*

NPS Designator	Specified Wall Thickness, in. (mm)	Factor C1 or C2
	0.500 (12.70)	285
	0.562 (14.28)	286
	0.625 (15.88)	287
	1.531 (38.88)	288
26	0.250 (6.35)	289
	0.264 (6.71)	290
	0.278 (7.06)	291
	0.281 (7.14)	292
	0.291 (7.39)	293
	0.312 (7.93)	294
	0.344 (8.74)	295
	0.375 (9.53)	296
	0.438 (11.13)	297
	0.500 (12.70)	298
30	0.250 (6.35)	299
	0.281 (7.14)	300
	0.287 (7.29)	301
	0.312 (7.93)	302
	0.328 (8.33)	303
	0.337 (8.56)	304
	0.344 (8.74)	305
	0.350 (8.89)	306
	0.365 (9.27)	307
	0.375 (9.53)	308
	0.391 (9.93)	309
	0.406 (10.31)	310
	0.417 (10.59)	311
	0.421 (10.69)	312
	0.428 (10.87)	313
	0.430 (10.92)	314
	0.437 (11.10)	315
	0.438 (11.13)	316
	0.450 (11.43)	317
	0.469 (11.91)	318
	0.500 (12.70)	319
	0.562 (14.28)	320
	0.563 (14.30)	321
	0.593 (15.06)	322
	0.625 (15.88)	323
	0.750 (19.05)	324
34	0.375 (9.53)	325
	0.416 (10.57)	326
	0.438 (11.13)	327
	0.469 (11.91)	328
	0.500 (12.70)	329
	0.524 (13.31)	330
	0.562 (14.28)	331
	0.566 (14.38)	332
	0.600 (15.24)	333
	0.628 (15.95)	334
	0.750 (19.05)	335
	0.754 (19.15)	336
	0.875 (22.23)	337
	1.250 (31.75)	338
36	0.312 (7.92)	339
	0.322 (8.18)	340
	0.344 (8.74)	341
	0.375 (9.53)	342
	0.391 (9.93)	343
	0.406 (10.31)	344
	0.422 (10.72)	345
	0.428 (10.87)	346
	0.438 (11.13)	347
	0.453 (11.51)	348
	0.469 (11.91)	349
	0.484 (12.29)	350
	0.500 (12.70)	351
	0.525 (13.33)	352
	0.562 (14.28)	353
	0.594 (15.09)	354

TABLE 7 *Continued*

NPS Designator	Specified Wall Thickness, in. (mm)	Factor C1 or C2
	0.625 (15.88)	355
	0.750 (19.05)	356
42	0.375 (9.52)	357
	0.500 (12.70)	358
	0.688 (17.48)	359

TABLE 8 List of base 62 Index Values

Type	Code
Default	0

APPENDIXES

(Nonmandatory Information)

X1. 62-BASE CONVERSION ALGORITHM

X1.1 General

X1.1.1 In general, the base or radix is the number of unique digits that a positional numeral system utilizes to represent a string of numbers or values. Examples of positional numeral systems include decimal (base-10), octal (base-8), hexadecimal (base-16), etc. In the positional numeral systems, it is important to note that there is a difference between the *character* and the positional value representing that character.

X1.1.2 This particular specification utilizes the base-62 encoding system which utilizes integer values from "0" to "9" and both the lowercase and uppercase alphabet characters. Table X1.1 represents the positional values corresponding to a particular character.

X1.1.3 Therefore, from Table X1.1, the position of 27 corresponds to the number or value of "r". The position of 61 corresponds to "Z". The position 6 corresponds to the number or value "6".

X1.1.4 The remainder of this Appendix shows examples for converting the initial integer string for the manufacturer's lot code and size into the final base-62 encoding alphanumeric characters.

X1.1.5 For the remainder of this Appendix, the term "TRUNC" represents truncating or shortening the calculated result by taking only the integer value and dropping the decimal value.

TABLE X1.1 Positional Values for Base-62 Systems

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

X1.2 Determination of the Manufacturer's Lot Code

X1.2.1 Let *PB* equal the initial integer string representing the manufacturer's lot code with up to 7 digits (maximum).

X1.2.2 Let $A_4A_3\ A_2A_1$ represent the final 4 alphanumeric character format for the production batch using the base-62 positional encoding system.

X1.2.3 To convert the initial integer input string into the final 4 character code, follow these steps:

X1.2.3.1 The first positional value, A_4, is determined by:

$$A_4 = TRUNC\left[\frac{PB}{62^3}\right] \quad \text{(X1.1)}$$

Lookup the corresponding positional value for the integer in Table X1.1.

X1.2.3.2 The second positional value, A_3, is determined by:

$$A_3 = TRUNC\left[\frac{PB - A_4(62^3)}{62^2}\right] \quad \text{(X1.2)}$$

Lookup the corresponding positional value for the integer in Table X1.1.

X1.2.3.3 The third positional value, A_2, is determined by:

$$A_2 = TRUNC\left[\frac{PB - A_4(62^3) - A_3(62^2)}{62^1}\right] \quad (X1.3)$$

Lookup the corresponding positional value for the integer in Table X1.1.

X1.2.3.4 The fourth positional value, A_1, is determined by:

$$A_1 = TRUNC\left[\frac{PB - A_4(62^3) - A_3(62^2) - A_2(62^1)}{62^0}\right] \quad (X1.4)$$

Lookup the corresponding positional value for the integer in Table X1.1.

X1.2.4 To convert the 4 character production code into the initial integer input string, follow these steps:

$$PB = A_4(62^3) + A_3(62^2) + A_2(62^1) + A_1(62^0) \quad (X1.5)$$

Where, the A_i must be the positional value for the respective character places.

X1.2.5 Sample calculation to convert the initial integer, *PB*, to the four character alphanumeric code.

X1.2.5.1 Let PB = 1234000

$$A_4 = TRUNC\left[\frac{PB}{62^3}\right] = TRUNC\left[\frac{1234000}{62^3}\right] = TRUNC[5.1778] = \text{“5”} \quad (X1.6)$$

$$\begin{aligned} A_3 &= TRUNC\left[\frac{PB - A_4(62^3)}{62^2}\right] \\ &= TRUNC\left[\frac{1234000 - 5(62^3)}{62^2}\right] \\ &= TRUNC[11.020] \\ &= 11 \\ &= \text{“}b\text{”} \end{aligned}$$

$$\begin{aligned} A_2 &= TRUNC\left[\frac{PB - A_4(62^3) - A_3(62^2)}{62^1}\right] \\ &= TRUNC\left[\frac{1234000 - 5(62^3) - 11(62^2)}{62^1}\right] \\ &= TRUNC[1.226] \\ &= \text{“1”} \end{aligned}$$

$$\begin{aligned} A_1 &= TRUNC\left[\frac{PB - A_4(62^3) - A_3(62^2) - A_2(62^1)}{62^0}\right] \\ &= TRUNC\left[\frac{1234000 - 5(62^3) - 11(62^2) - 1(62^1)}{62^0}\right] \\ &= 14 \\ &= \text{“}e\text{”} \end{aligned}$$

X1.2.5.2 Therefore, PB = 1234000 is in the form “5*b*1*e*”.

X1.2.6 Sample calculation to convert “5*b*1 *e*” to the initial integer input, use the positional values for each of the respective places:

$$D = 5(62^3) + 11(62^2) + 1(62^1) + 14(62^0) = 1234000 \quad (X1.7)$$

X1.3 Determination of the Component Size Code

X1.3.1 Determine the value for D using Eq 1 from the specification based on the geometric size for the respective component.

X1.3.2 To convert the initial integer input string, D, into the final 3 character code, follow these steps:

X1.3.2.1 The first positional value, A_3, is determined by:

$$A_3 = TRUNC\left[\frac{D}{62^2}\right] \quad (X1.8)$$

Lookup the corresponding positional value for the integer in Table X1.1.

X1.3.2.2 The second positional value, A_2, is determined by:

$$A_2 = TRUNC\left[\frac{D - A_3(62^2)}{62^1}\right] \quad (X1.9)$$

Lookup the corresponding positional value for the integer in Table X1.1.

X1.3.2.3 The third positional value, A_1, is determined by:

$$A_1 = TRUNC\left[\frac{D - A_3(62^2) - A_2(62^1)}{62^0}\right] \quad (X1.10)$$

Lookup the corresponding positional value for the integer in Table X1.1.

X1.3.3 To convert the 3 character component size code into the initial integer input string, follow these steps:

$$D = A_3(62^2) + A_2(62^1) + A_1(62^0) \quad (X1.11)$$

Where, the A_i must be the positional value for the respective character places.

X1.3.4 The steps below gives an example of how to convert an initial integer input, D, for a particular size as determined by using the tables for coefficients in the main body of the specification and Eq 1, into the following three character alphanumeric code.

X1.3.4.1 For the case of pipe or in-line fittings where $D2$ = $D1$, $C2$ will be equal to $C1$.

X1.3.4.2 For a 1-½ inch IPS 0.090” wall pipe, the value for $C2$ = $C1$ = 36.

X1.3.4.3 Using Eq 1, the value for D is given by:

D = ($C1$*378)+$C2$+1

D = (36*378)+36+1

D = 13645

X1.3.5 Sample calculation to convert the initial integer, D, to the three character alphanumeric code.

NOTE X1.1—The calculation methodology shown below is applicable to both the date field and the size field that requires converting an initial integer string to a three character alphanumeric code.

X1.3.5.1 Let D = 13645

$$A_3 = TRUNC\left[\frac{D}{62^2}\right] = TRUNC\left[\frac{13645}{62^2}\right] = TRUNC[3.550] = \text{“3”} \quad (X1.12)$$

$$\begin{aligned} A_2 &= TRUNC\left[\frac{D - A_3(62^2)}{62^1}\right] \\ &= TRUNC\left[\frac{13645 - 3(62^2)}{62^1}\right] \end{aligned}$$

$$= TRUNC[34.08]$$
$$= 34$$
$$= \text{“}y\text{”}$$

$$A_1 = TRUNC\left[\frac{D - A_3(62^2) - A_2(62^1)}{62^0}\right]$$
$$= TRUNC\left[\frac{13645 - 3(62^2) - 34(62^1)}{62^0}\right]$$
$$= 5$$
$$= \text{“}5\text{”}$$

X1.3.5.2 Therefore, D = 13645 is in the form “3*y*5”.

X1.3.6 Sample calculation to convert “3*y*5” to the initial integer input, use the positional values for each of the respective places:

$$D = 3(62^2) + 34(62^1) + 5(62^0) = 13645 \qquad (X1.13)$$

X2. EXAMPLE

X2.1 As an example, the final structure and format for the base-62 traceability identifier resulting from the use of this specification is shown in Table X2.1.

X2.2 Therefore, the final code of “XX5b1e2RAB123y50” corresponds to a 1-½ inch IPS 0.090” wall Coiled PE2708 pipe produced by “Pipe Dreams, Inc.” with a production lot number of 1234000 on 110th day of 2010.

X2.3 This information can then be reproduced using various bar coding technologies and strategies as shown in Fig. X2.1 .

TABLE X2.1 Example of the Final Format and Structure of Gas Traceability Component Identifier

Character Number	Source	Description of Information	Character	Information
1	www.componentid.org	Name of component manufacturer	X	Corresponds to list on www.componentid.org
2			X	
3	Component Manufacturer’s lot code	Information which can help ascertain relevant traceability information upon request	5	Corresponds to the mfg lot number of 1234000
4			b	
5			1	
6			e	
7	Component production date code per 5.3	Date of manufacture of given component	2	Corresponds to production date of 11010, that is, 110th day of 2010
8			R	
9			A	
10	Component material type per Table 3	Material used for component	B	PE 2708
11	Component Type per Table 4	Component type	1	Pipe – Coiled
12			2	
13	Component size per 5.6	Component size	3	Corresponds to size code of 13645 for 1-½ inch IPS 0.090” wall pipe
14			y	
15			5	
16	www.componentid.org	Reserved for future use	0	Default value

Code 128 Bar Code

2D Data Matrix – Aztec Format

FIG. X2.1 Code 128 Bar Code and 2D Data Matrix – Aztec Format

SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (F2897–15) that may impact the use of this standard. (Approved November 1, 2015)

(1) Note 8 and Note 11 were revised.
(2) Note 12 was deleted and subsequent notes were renumbered.

Committee F17 has identified the location of selected changes to this standard since the last issue (F2897–14) that may impact the use of this standard. (Approved April 1, 2015)

(1) Table 4 was revised.

Committee F17 has identified the location of selected changes to this standard since the last issue (F2897–11a$^{\varepsilon 1}$) that may impact the use of this standard. (Approved April 1, 2014)

(1) Section 2 was revised.
(2) Table 3 was revised.
(3) Note 9 was added.
(4) Table 4 was revised.