الرقـــم: 4713 / 3877
التاريخ: 1 / 12 /**2024**

السادة أعضاء غرفة تجارة عمّان المحترمين،
عمان – الأردن.

الموضوع : المواصفة القياسية الأردنية الخاصة بأنظمة الأنابيب اللدائنية لتصريف المياه ومياه الصرف الصحي تحت الأرض وبدون ضغط

تحية طيبة وبعد،

تُهدي غرفة تجارة عمّان سعادتكم أطيب تحياتها، وأرجو أن أرفق لسعادتكم نُسخة عن كتاب السادة مؤسسة المواصفات والمقاييس ومرفقاته المُتضمنة نسخة عن **مشروع التصويت للمواصفة القياسية الأردنية (2016-1/2024) الخاصة بأنظمة الأنابيب اللدائنية لتصريف المياه ومياه الصرف الصحي تحت الأرض وبدون ضغط / أنظمة الأنابيب ذات الجدران المبنية من متعدد كلوريد الفنيل غير الملدن ومتعدد البروبلين ومتعدد الإثيلين، الجزء 1: المتطلبات العامة وخصائص الأداء**، والذي أعدّته اللجنة الفنية الدائمة للدائن رقم (22).

راجياً سعادتكم التكرّم بالاطلاع، والإيعاز لمن يلزم لديكم لتحويل مشروع المواصفة المُشار إليها أعلاه للشخص الفنّي المعني لديكم لدراستها (إن وجد) ، والتكرم بإعلامنا خطياً عن رأيكم بشأنها خلال موعد أقصاه **شهر** من تاريخه ، تمهيداً لمخاطبة السادة مؤسسة المواصفات والمقاييس، **[علماً بأن عدم الرد خلال هذه الفترة يُعتبر من قِبل المُؤسّسة بمثابة موافقة على المشروع]** .

وتفضلوا سعادتكم بقبول فائق التحية والإحترام،،،

غالب محمد حجازي
Hijazi
المـدير العـام

ل.م / هـ ق

اليوبيل الفضي
مؤسسة المواصفات والمقاييس الأردنية

الرقم: م / علم / 24509
التاريخ: 26 / 05 / 1446 هـ
الموافق: 28 / 11 / 2024 م

معالي .....
عطوفة .....
سعادة .....

تحية طيبة وبعد،

أرجو معاليكم/عطوفتكم/سعادتكم التكرم بالعلم بأن أسلوب العمل الفني المتبع في وضع المواصفات القياسية والقواعد الفنية الأردنية يقتضي تعميم مشروع التصويت على الجهات ذات العلاقة، وذلك لإبداء الرأي والتصويت عليه تمهيدا لعرضه على مجلس الإدارة لاعتماده كمواصفة قياسية أو قاعدة فنية أردنية.

لذا أرجو أن أرفق لكم طيا نسخة عن مشروع التصويت للمواصفة القياسية الأردنية ٢٠١٦-٢٠٢٤/١ الخاصة بأنظمة الأنابيب اللدائنية لتصريف المياه ومياه الصرف الصحي تحت الأرض وبدون ضغط ـ أنظمة الأنابيب ذات الجدران المبنية من متعدد كلوريد الفنيل غير الملدن ومتعدد البروبلين ومتعدد الإثيلين، الجزء ١: المتطلبات العامة وخصائص الأداء، الذي أعدته اللجنة الفنية الدائمة للدائن رقم (٢٢).

يرجى التكرم بعرض هذا المشروع على المختصين لديكم وموافاتنا بردكم عليه خلال شهرين من تاريخه، وذلك باستخدام بطاقة التصويت المرفقة، علما بأن عدم الرد خلال المدة يعتبر موافقة من قبلكم على المشروع المذكور.

وتفضلوا بقبول فائق الاحترام

المديـــر العـــام
م. عبير بركات الزهير

المرفقات:
- مشروع التصويت
- بطاقة التصويت

نسخة/ مدير مديرية التقييس
نسخة/ رئيس قسم فحص ومتابعة المواصفات
نسخة/ رئيس قسم الصناعات الكيميائية
نسخة/ م. كفاح صالح
غدير ٢٠٢٤/١١/٢٦

مؤسسة المواصفات والمقاييس الأردنية

بطاقة تصويت

رقم المشروع: ٢٠١٦-١/٢٠٢٤	**عنوان المشروع:** أنظمة الأنابيب اللدائنية لتصريف المياه ومياه الصرف الصحي تحت الأرض وبدون ضغط ـ أنظمة الأنابيب ذات الجدران المبنية من متعدد كلوريد الفنيل غير الملدّن ومتعدد البروبلين ومتعدد الإثيلين. الجزء ١: المتطلبات العامة وخصائص الأداء.
اسم اللجنة الفنية: اللدائن (٢٢)	**سكرتير اللجنة الفنية:** م. كفاح صالح
تاريخ التعميم: ٢٠٢٤/١١/٢٦	**آخر موعد للرد:** ٢٠٢٥/٠١/٢٦

الرقم	نوع الملاحظة			الملاحظة *	التعديل المقترح	رأي اللجنة الفنية
	عامة	فنية	هيكلية وصياغية			

النتيجة النهائية للتصويت:

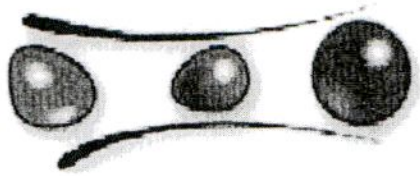
☐ موافقة (لا توجد ملاحظات).

☐ موافقة مع الملاحظات المرفقة، والتي يمكن الأخذ بها أو تجاوزها حسب الاقتضاء.

☐ عدم موافقة للأسباب الفنية المرفقة، والتي عند زوالها ينقلب التصويت إلى موافقة.

* يرجى تزويدنا بالمراجع التي اعتمد عليها في حالة وجود ملاحظات.

الجهة القائمة بالتصويت:	**التاريخ:**
اسم الشخص المسؤول:	



ع ت ٢٠١٦-١/٢٠٢٤
الإصدار الثاني

DJS 2016 - 1:2024
Second edition

مشروع تصويت

أنظمة الأنابيب اللدائنية لتصريف المياه ومياه الصرف الصحي تحت الأرض وبدون ضغط - أنظمة الأنابيب ذات الجدران المبنية من متعدد كلوريد الفنيل غير الملدّن ومتعدد البروبلين ومتعدد الإثيلين

الجزء ١: المتطلبات العامة وخصائص الأداء

Plastics piping systems for non-pressure underground drainage and sewerage – Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE)
Part 1: General requirements and performance characteristics

مؤسسة المواصفات والمقاييس
المملكة الأردنية الهاشمية

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Foreword

Jordan Standards and Metrology Organization is the national standardization body in Jordan. The work of preparing Jordanian standards is normally carried out by technical committees composed of the interested parties, which are involved in the scope of the standard. All the interested parties have the right to vote on the draft Jordanian Standard during the enquiry stage, taking into consideration the importance of harmonizing Jordanian Standards with the International, regional or national standards (as much as possible) for the purpose of eliminating technical barriers to trade and facilitating international trade.

Jordanian Standards are drafted in accordance with the rules given in the Jordanian Directive 1-2/2005, Part 2: Rules for the structure and drafting of Jordanian Standards *.

The permanent technical committee for Plastics 22 has studied the Jordanian Standard 2016-1:2012 related to **"Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE), Part 1: General requirements and performance characteristics"**, and the prepared project 2016-1:2024 related to **"Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE), Part 1: General requirements and performance characteristics"** and has recommended to approve the amended project as a Jordanian Standard 2016-1:2024, according to article (12) of Standards and Metrology Law No. (22) for the year 2000 and it's amendments.

This Jordanian Standard includes the following parts under the same general title, **"Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly (vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE)"**:
- Part 1: General requirements and performance characteristics.
- Part 2: Specifications for pipes and fittings with smooth internal and external surface and the system, Type A.
- Part 3: Specifications for pipes and fittings with smooth internal and profiled external surface and the system, Type B.

This Jordanian Standard 2016-1:2024 is a modified adoption of the European Standard 13476-1:2018 **"Plastics piping systems for non-pressure underground drainage and sewerage – Structured-wall piping systems of unplasticized poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE), Part 1: General requirements and performance characteristics"**, using reprint method, single vertical bars (|) in the margins are used to indicate the applicable technical modifications which have been changed and listed below, and single vertical dotted bars (:) in the margins are used to indicate the applicable editorial modifications which have been changed and listed below.
For the purposes of this part of Jordanian Standard, the following technical change have been made:
- Substitution of (EN 13476-2, EN 13476-3) by (JS 2016-2, JS 2016-3) to confirm with published Jordanian Standards.

* Under amendment.

For the purposes of this part of Jordanian Standard, the following editorial changes have been made:
- Substitution of "this European Standard", "this Standard" and "this document" by "this Jordanian Standard".
- Rearrange normative references in ascending order, applying the Jordanian Directive 1-2:2005, part 2: rules for the structure and drafting of Jordanian Standards.
change title of clause 3 from "Terms and definitions" to Terms and definitions, symbols and abbreviations"
- Rearrange the symbols Z1, Z2, Z3 in clause 3-2 in different rows.
- Addition of Note "For dimensions larger than DN 3 000 OD/ID this Jordanian Standard may be applied regarding appearance, colour, physical and mechanical characteristics as well as performance requirements" as Note 1 into Table 1.
- Addition of statement " Other sizes are permitted when following the conditions given in JS 2016-2 or JS 2016-3" as Note 2 into Table 1.
- Deletion of the paragraph: " In some European countries, sewer cleaning is typically carried out using small portable rigs that employ low volumes of water at high pressure through small-bore (typically 1 mm) nozzles." from clause D-2-1 because it is an information referred to some European countries.
- Addition of the unit of the pressure "Pressure in bar" at the top of table D-1.
- Inclusion of bibliography in an informative Annex E.

A list of Jordanian Standards identical to the European standards which are referenced in the adopted standard, including its amendments is given below:
- JS 532-1:2007 EN 681-1:1996 is identical to EN 681-1:1996, Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications, Part 1: Vulcanized rubber.
- JS 532-2:2007 EN 681-2:2000 is identical to EN 681-2:2000, Elastomeric Seals - Materials requirements for pipe joint seals used in water and drainage applications, Part 2: Thermoplastic elastomers.
- JS 532-4:2007 EN 681-4:2000 is identical to EN 681-4:2000, Elastomeric seals - Materials requirements for pipe joint seals used in water and drainage applications, Part 4: Cast polyurethane sealing elements.
- JS 324-1:2002 EN ISO 1043-1:2001 is identical to EN ISO 1043-1:2001, Plastics — Symbols and abbreviated terms, Part 1: Basic polymers and their special characteristics.

Plastics piping systems for non-pressure underground drainage and sewerage — Structured-wall piping systems of unplasticized poly (vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE)
Part 1: General requirements and performance characteristics

1- Scope

1-1 This Jordanian Standard, together with JS 2016-2 and JS 2016-3 specifies the definitions and general requirements for pipes, fittings and the system based on unplasticized poly (vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE) structured-wall piping systems that are to be used for non-pressure underground drainage and sewerage systems.

1-2 This Jordanian Standard is applicable to:

a) structured-wall pipes and fittings, which are to be used buried in the ground outside a building structure only; reflected by the marking of products by "U".

b) structured-wall pipes and fittings, which are to be used buried in ground both outside (application area code "U") and within a building structure (application area code "D"); reflected in the marking of products by "UD".

In conjunction with EN JS 2016-2 and EN JS 2016-3 it is applicable to structured-wall pipes and fittings with or without an integral socket with elastomeric ring seal joints, as well as welded and fused joints.

1-3 This part specifies general aspects and gives guidance concerning a national selection of requirement levels and classes where part 2 and part 3 of this Jordanian Standard provide options.

JS 2016-2 and JS 2016-3 specify material characteristics, dimensions and tolerances, test methods, test parameters and requirements for pipes with smooth internal and external surfaces, Type A, and pipes with smooth internal and profiled external surfaces, Type B.

This Jordanian standard, together with JS 2016-2 and JS 2016-3, covers a range of pipe and fitting sizes, materials, pipe constructions, stiffness classes and tolerance classes and offers recommendations concerning colours.

Note 1: it is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements and any relevant national regulations and installation practices or codes.

Note 2: Pipes, fittings and other components conforming to any plastic product standards referred to in clause 2 can be used with pipes and fittings conforming to this Jordanian Standard, when they conform to the requirements for joint dimensions given in part 2 and part 3 of this Jordanian Standard and to the performance requirements given in clause 9.

2- Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies:

- ISO 11922-1, Thermoplastics pipes for the conveyance of fluids - Dimensions and tolerances, Part 1: Metric series.
- EN ISO 472, Plastics – Vocabulary (ISO 472).
- EN 681-1, Elastomeric seals – Materials requirements for pipe joint seals used in water and drainage applications, Part 1: Vulcanized rubber.
- EN 681-2, Elastomeric seals – Materials requirements for pipe joint seals used in water and drainage applications, Part 2: Thermoplastic elastomers.

- EN 681-4, Elastomeric seals – Materials requirements for pipe joint seals used in water and drainage applications, Part 4: Cast polyurethane sealing elements.
- EN ISO 1043-1, Plastics – Symbols and abbreviated terms, Part 1: Basic polymers and their special characteristics (ISO 1043-1).
- EN ISO 9969, Thermoplastics pipes – Determination of ring stiffness (ISO 9969).
- JS 2016-2:2024, Plastics piping systems for non-pressure underground drainage and sewerage – Structured-wall piping systems of unplasticized poly (vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE), Part 2: Specifications for pipes and fittings with smooth internal and external surface and the system, Type A.
- JS 2016-3:2024, Plastics piping systems for non-pressure underground drainage and sewerage – Structured-wall piping systems of unplasticized poly (vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE), Part 3: Specifications for pipes and fittings with smooth internal and profiled external surface and the system, Type B.
- EN ISO 13967, Thermoplastics fittings – Determination of ring stiffness (ISO 13967).

3- Terms and definitions, symbols and abbreviations

For the purposes of this Jordanian Standard, the following terms and definitions given in EN ISO 472, EN ISO 1043-1, ISO 11922-1and the following apply.
ISO and IEC maintain terminological databases for use in standardization at the following addresses:
• IEC Electropedia: available at http://www.electropedia.org/
• ISO Online browsing platform: available at http://www.iso.org/obp

3-1 Terms and Definitions

3-1-1 General definitions

3-1-1-1
application area code
code used to mark pipes and fittings to indicate the permitted application area(s) for which they are intended, as follows:
Example 1: U: code for the area more than 1 m from the building to which the buried piping system is connected.
Example 2: D: code for the area under and within 1 m from the building where the pipes and fittings are buried underground and are connected to the soil and waste discharge system of the building.
Note: In the "D" application area, the existence of hot water discharge in addition to external forces from the surroundings is usual.

3-1-1-2
structured-wall pipes and fittings
products which have an optimized design with regard to material usage to achieve the physical, mechanical and performance requirements of this Jordanian Standard
Note: For a description of the particular designs covered by this Jordanian Standard, see clause 5 in JS 2016-2:2024 and JS 2016-3:2024.

3-1-1-3
fabricated fitting
fitting produced from pipe and/or from injection-moulded fittings by thermoforming, solvent-cementing or welding
Note: Sealed ring retaining components are not considered as a piece.

3-1-2 Geometrical definitions

3-1-2-1

nominal size, DN

numerical designation of the size of a component, other than a component designated by thread size, which is approximately equal to the manufacturing dimension in mm

3-1-2-2

nominal size, DN/OD

nominal size, related to the outside diameter

3-1-2-3

nominal size, DN/ID

nominal size, related to the inside diameter

3-1-2-4

nominal diameter

d_n

specified diameter, in mm, assigned to a nominal size (DN/OD or DN/ID)

3-1-2-5

outside diameter

d_e

value of the measurement of the outside diameter through its cross-section at any point of a pipe or spigot, rounded to the next greatest 0,1 mm

Note: For Type B constructions, see JS 2016-3.

3-1-2-6

mean outside diameter

d_{em}

value of the measurement of the outer circumference of a pipe or spigot in any cross-section divided by π (pi = 3,142), rounded to the next greatest 0,1 mm

Note: For Type B constructions, see JS 2016-3.

3-1-2-7

mean inside diameter

d_{im}

average value of a number of equally spaced measurements of inside diameter in the same cross-section of a pipe or fitting

3-1-2-8

wall thickness

e

measured wall thickness at any point of the body of a component

3-1-2-9

construction height

e_c

radial distance between the top of ribs or corrugation or, in case of Type A1 and Type A2 pipes and fittings, the external surface of the wall and the internal surface of the wall

3-1-2-10

ring flexibility

ability of a pipe to resist diametric deflection without the loss of structural integrity

3-1-2-11

pipe stiffness

mechanical characteristic of a pipe, which is a measure of the resistance to ring deflection under an external force as determined in accordance with EN ISO 9969

3-1-2-12
fitting stiffness
mechanical characteristic of a fitting which is a measure of the resistance to ring deflection under an external force as determined in accordance with ISO 13967.

3-1-2-13
ring stiffness class, SN
numerical designation of the ring stiffness of the pipe or fitting which is a convenient round number, indicating the minimum required ring stiffness of the pipe or stiffness of the fitting

3-2 Symbols and abbreviations

$d_{n,1}$: nominal diameter of the main of a branch.
$d_{n,2}$: nominal diameter of the branch of a branch.
L_1: insert length
Z_1: design length of a fitting.
Z_2: design length of a fitting.
Z_3: design length of a fitting.
α: nominal angle of fitting.
DN: nominal size.
DN/ID: nominal size related to inside diameter.
DN/OD: nominal size related to outside diameter.
PE: polyethylene.
PP: polypropylene.
PP-MD: Mineral modified PP.
PVC-U: unplasticized poly (vinyl chloride).
RF: ring flexibility performance.
S: pipe series S.
SDR: standard dimension ratio.
SN: ring stiffness class.

4- Material

4-1 General

The material shall be one of the materials specified in the relevant annexes of JS 2016-2 or JS 2016-3, as applicable.
Note: Information about general material characteristics is given in Annex A.

4-2 Utilization of non-virgin material

The specifications for the material and levels of permitted addition are specified in JS 2016-2 or JS 2016-3.

4-3 Sealing ring retaining components

It is permitted that sealing rings are retained using components made from polymers other than PVC U, PP or PE.

4-4 Sealing rings

The sealing ring material shall conform to all the requirements in EN 681-1, EN 681-2 or EN 681-4, as applicable. The sealing ring shall have no detrimental effects on the component properties.

4-5 Fused or welded joints

When fused or welded joints are used, the pipes and/or fittings manufacturer's instructions for jointing shall be followed.

4-6 Adhesives for PVC-U

Requirements for adhesives for jointing of PVC-U are specified in clause 4-7 of JS 2016-2:2024 and clause 4-7 of JS 2016-3:2024.

5- Designation of wall construction

Pipes and fittings with smooth internal and external surfaces are designated as Type A. Pipes and fittings with smooth internal and profiled external surfaces are designated as Type B.
Definitions of wall constructions including schematic sketches and examples of typical jointing methods are given in JS 2016-2 for Type A pipes and in JS 2016-3 for Type B pipes.

6- Appearance and colour

6-1 Appearance

When viewed without magnification the following requirements apply:
a) visible surfaces of pipes and fittings shall be smooth, clean and free from grooving, blistering, visible impurities or pores and any other surface irregularity likely to prevent conformity to this Jordanian Standard.
b) pipe and fittings ends shall be cleanly cut square to the axis of the pipe, and within any cutting zone recommended by the manufacturer, or according to the profile geometry as specified by the manufacturer.
c) edges on spirally formed pipes and fittings which become sharp when cut, shall be rounded off.

6-2 Colour

The inner and outer layer of pipes and fittings shall be coloured throughout. The external layer of pipes and fittings should preferably be black, orange-brown (approximately RAL 8023 [1]) or dusty grey (approximately RAL 7037 [1]). Other colours may be used.

7- Geometrical characteristics

This Jordanian standard specifies nominal sizes for DN/ID given in table 1 and for DN/OD given in table 2.

Table 1 – Nominal sizes

Nominal sizes: DN/ID (in mm)	100, 125, 150, 200, 225, 250, 300, 400, 500, 600, 800, 1 000, 1 200, 1 400, 1 600, 1 800, 2 000, 2 200, 2 400, 2 500, 2 600, 2 800, 3 000
Nominal sizes: DN/OD (in mm)	110, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1 000, 1 200, 1 400, 1 600, 1 800, 2 000, 2 200, 2 400, 2 500, 2 600, 2 800, 3 000
Note1: For dimensions larger than DN 3 000 OD/ID this Jordanian Standard may be applied regarding appearance, colour, physical and mechanical characteristics as well as performance requirements. Note2: Other sizes are permitted when following the conditions given in JS 2016-2 or JS 2016-3.	

8- Types of fittings

8-1 General

This Jordanian Standard is applicable for the following types of fittings.
Figures 1 to 6 give examples for typical designs. Other designs of fittings including all socket and all spigot, are permitted.
a) Bends un-swept and swept angle (see figure 1 and figure 2).
Note 1: Preferred nominal angles, α, are the following: 15°, 22,5°, 30°, 45° and between 87,5° and 90°.

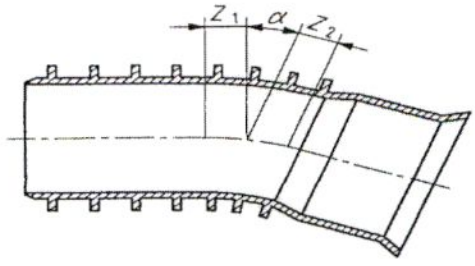

Figure 1 – Example of an un-swept bend

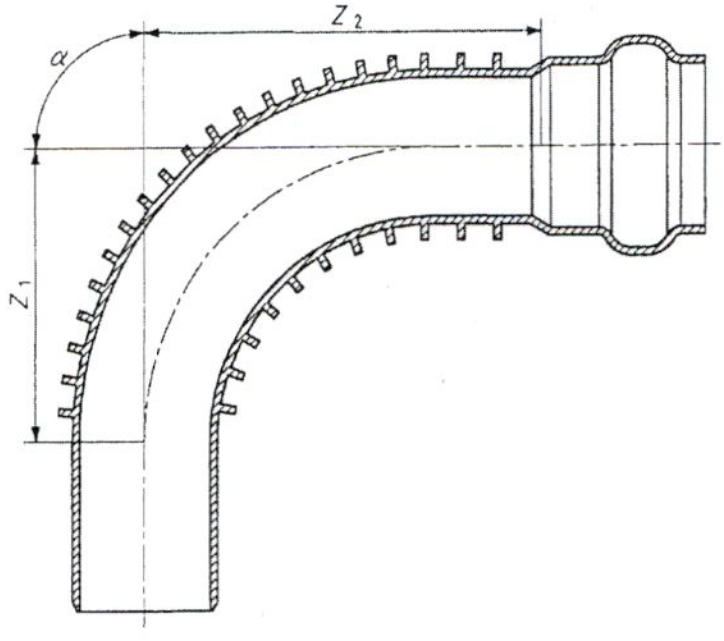

Figure 2 – Example of a swept bend

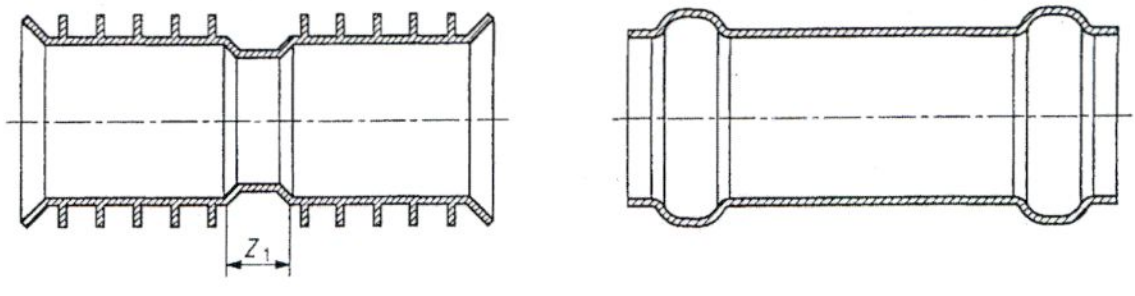

Figure 3 – Example of coupler and slip coupler

b) Reducers (see figure 4).

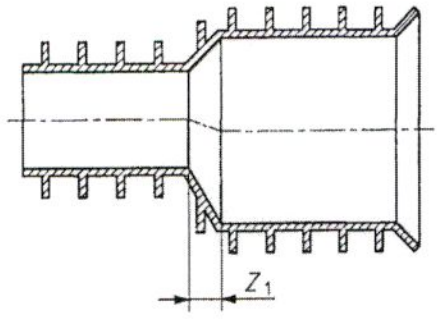

Figure 4 – Example of reducer

c) Branches and reducing branches un-swept and swept entry (see figure 5).
Note 2: Preferred nominal angles, α, are 45° and between 87,5° and 90°.

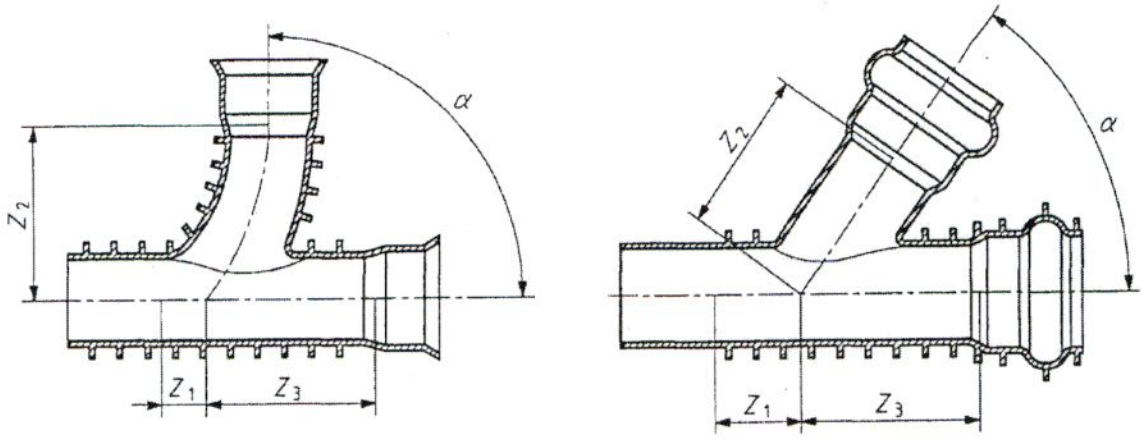

Figure 5 – Example of a swept entry and a straight branch

d) Plugs (see figure 6).
The insert length, L_1, shall be sufficient to ensure engagement of the sealing ring of at least 10 mm:
a) when measured from the effective sealing point to the end of the cylindrical part of the spigot when the sealing ring is positioned in the socket, or
b) when measured from the effective sealing point to the mouth of the cylindrical part of the socket when the sealing ring is positioned on the spigot.

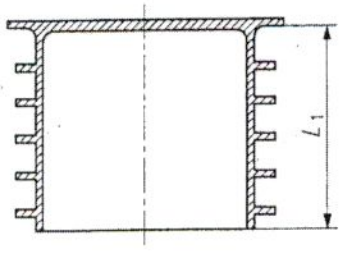

Figure 6 – Example of a plug

8-2 Design length of fittings

The design length(s) (Z-lengths) of the fittings (see figure 1 to figure 6) shall be declared by the manufacturer.

Note: The design lengths (Z-lengths) are intended to assist with the design of moulds and are not intended to be used for quality control purposes, ISO 265-1:1988 [2] can be used as a guideline.

9- System performance related test methods and characteristics

The performance of the installed piping system depends on the quality of the system components and installation conditions and workmanship.

The performance requirements of the system components and their relation to the tested characteristics specified in JS 2016-2 or JS 2016-3, as applicable, are explained in table 4.

Annex B gives guidelines for structural design.

Table 2 – Relationship between system performance and tested characteristics

System Performance	Tested characteristic		Reference		Test Method
			JS 2016-2	JS 2016-3	
Handling, transport, storing and installation robustness	Pipes	Impact strength	Table 14	Table 14	EN ISO 3127 [3] or EN ISO 11173 [4]
		Tensile strength of seam	Table 14	Table 14	EN ISO 13262 [5]
	Fittings	Impact strength	Table 16	Table 16	EN ISO 13263 [6]
Resistance to soil load including traffic load, both during and after installation	Pipes	Ring stiffness	Table 14	Table 14	EN ISO 9969
		Ring flexibility	Table 14	Table 14	EN ISO 13968 [8]
		Tensile strength of seam	Table 14	Table 14	EN ISO 13262 [5]
		Creep ratio	Table 14	Table 14	EN ISO 9967 [9]
	Fittings	Ring stiffness	Table 16	Table 16	EN ISO 13967 /same stiffness class as pipe if same wall construction as pipe
		Mechanical strength or flexibility of fabricated fitting	Table 16	Table 16	EN ISO 13264 [10]
Ability to hold fluid inside and outside the system (leak tightness)	System	Dimensions and tolerances	Clause 7	Clause 7	EN ISO 3126 [11]
		Tightness	Table 17	Table 17	ISO 13259 [12]
		Water tightness – fabricated fittings	Table 17	Table 17	EN 476:2011, clause 6-5 [7]
		Tensile test of welded and fused joints	Table 17	Table 17	EN ISO 13262 [5]

Table 2 – Relationship between system performance and tested characteristics (continued)

System Performance	Tested characteristic		Reference		Test Method
			JS 2016-2	JS 2016-3	
Resistance to high temperature	System	Elevated temperature cycling for sizes up to 160 mm (ID)/200 mm (OD)	Table 17	Table 17	EN ISO 13257 [13], assembly B, Figure 2 (EN 476:2011, clause 8-2 [7])
		Box loading	Table 17	Table 17	Method A or B of EN ISO 13260 [14]
Cleaning and maintenance	System	Rodding; Flushing; High volume low pressure High pressure cleaning	—	—	See [a]
Effect of processing on long term performance	Pipes	Resistance to dichloromethane	Table 8	Table 8	EN ISO 9852 [15] (PVC only)
		Strain at break ≥ 80 %	Table 8	Table 8	EN ISO 6259-1 and ISO 6259-2
		Resistance to heating – oven test – Type B	n.a.	Tables 8, 10, and 12	ISO 12091 [16]
		Longitudinal reversion – Type A	Tables 8, 10, and 12	n.a.	EN ISO 2505 [17]
	Fittings	Resistance to heating – oven test	Tables 9, 11, 13	Tables 9, 11, 13	EN ISO 580 [37]
Long term performance material	Material	Resistance to internal pressure	Tables 1, 2, 3, 4	Tables 1, 2, 3, 4	EN ISO 1167-1 [18] and EN ISO 1167-2 [19]
		Chemical resistance	Tables 1, 2, 3, 4	Tables 1, 2, 3, 4	ISO/TR 10358 [20]
		Thermal stability, raw material maintenance	Tables 2,3,4	Tables 2, 3, 4	EN ISO 11357-6 [21] (PE and PP only)

[a] Test methods for cleaning and maintenance are not included in this Jordanian Standard. Experience has shown that the wall thickness, impact resistance and material requirements given in JS 2016-2 or JS 2016-3, as applicable, ensure that the systems can resist the normal cleaning procedures. See also Annex D for guidance on practical cleaning.

10- Marking, general

10-1 Presentation

Marking elements shall be printed or formed directly on the component or be on a label in such a way that after storage, handling and installation, the required legibility is maintained.

Three levels of legibility of the marking on components are specified for the individual marking aspects given in JS 2016-2 and JS 2016-3. The required legibility of marking is coded as follows:

a) durable in use.
b) legible at least until the system is installed.
c) marking on the packaging is legible at least until the component is installed.

Note: The manufacturer is not responsible for marking becoming illegible due to actions during installation and use such as painting, scratching, covering of the components or by use of e.g. detergents on the components, unless agreed with, or specified by the manufacturer.

10-2 Marking process

Marking shall be carried out so it does not initiate cracks or other types of defects which are likely to prevent conformity to this Jordanian Standard.

10-3 Size

The size of the marking shall be such that the marking is legible without magnification.

Annex A
(Informative)
Characteristics of PVC-U, PP and PE pipes and fittings

A-1 General

EN 476 [7] specifies general requirements for components used in discharge pipes, drains and sewers for gravity systems. Pipes and fittings conforming to this Jordanian Standard meet these requirements.

A-2 Material characteristics

The materials of pipes and fittings conforming to this Jordanian Standard have the characteristics given in table A – 1.

Table A – 1 – General material characteristics

Characteristic	PVC-U	PP	PE	Unit
Modulus of elasticity, short-term value	≥ 3 200	≥ 1 250	≥ 800	MPa
Average density	≈ 1 400	≈ 900	≈ 940	kg/m^3
Average coefficient of linear thermal expansion	$\approx 6 \times 10^{-5}$	$\approx 14 \times 10^{-5}$	$\approx 17 \times 10^{-5}$	K^{-1}
Thermal conductivity	≈ 0,16	≈ 0,2	≈ (0,36 to 0,50)	$WK^{-1}m^{-1}$
Specific heat capacity	≈ (850 to 2 000)	≈ 2 000	≈ (2 300 to 2 900)	$Jkg^{-1}K^{-1}$
Surface resistance	$> 10^{12}$	$> 10^{12}$	$> 10^{13}$	Ω
Poisson ratio	0,4	0,42	0,45	(-)
Note: Values are dependent on the material used. Therefore, it is recommended to contact the manufacturer, or see the manufacturer's documentation, for the relevant values in each individual case.				

If information regarding the tensile strength and/or elongation of break of a material is needed, they can be determined in accordance with EN ISO 6259-1 [22] combined with EN ISO 6259-2 [23] or EN ISO 6259-3 [24] as applicable.

A-3 Chemical resistance

Piping systems conforming to this Jordanian Standard are resistant to corrosion by water with a wide range of pH values such as domestic wastewater, rainwater, surface water and ground water. If piping systems conforming to this Jordanian Standard are to be used for chemically contaminated wastewaters, such as industrial discharges, chemical and temperature resistance have to be taken into account.

For information about the chemical resistance of PVC, PP and PE materials, guidance is given in ISO/TR 10358 [20] and for rubber materials in ISO/TR 7620 [25].

A-4 Abrasion resistance

Pipes and fittings conforming to this Jordanian Standard are resistant to abrasion.
The abrasion can be determined from the test method given in EN 295-3:1991 [26].

A-5 Hydraulic roughness

The internal surfaces of pipes and fittings conforming to this Jordanian Standard are hydraulically smooth. The design of joints and fittings ensure good hydraulic performances. For further information about hydraulic capacity of pipes and fittings conforming to this Jordanian Standard refer to the manufacturer's information. See CEN/TS 15223 [33].

Annex B
(Informative)
Structural design

In general, creating a structural design of a thermo-plastics pipeline construction by applying analytical or numerical methods is not needed. Any calculated prediction of the pipe behaviour and reality is strongly dependent on the conditions used for the calculation being the same as used for the installation. Therefore, it is important that effort is put into controlling the input values by extensive soil surveys and monitoring the installation. In many cases, practical and/or reference information is available and results in a sound prediction of the pipe performance. For further information, see CEN/TS 15223[33].

Because of their geometry, solid–wall fittings have a stiffness greater than the stiffness of the pipe with corresponding wall-thickness series. Therefore, the recommended stiffness classes/wall-thickness series of fittings for use with structured-wall pipes given in Table B – 1 applies:

Table B – 1 – Minimum fitting classes recommended for use with structured wall pipes

Pipe stiffness class	Minimum stiffness of fittings according to:		Minimum wall-thickness series of fittings according to:		
	JS 2016-2 and JS 2016-3	EN14758-1[31]	EN 1852-1[29]	EN 1401-1[28]	EN 12666-1[30]
SN 2	SN 2	SN 4	S 20	SDR 51	SDR 33
SN 4	SN 4	SN 4	S 20	SDR 51	SDR 33
SN 8	SN 8	SN 8	S 16	SDR 41	SDR 26
SN 16	SN 16	—	S 13,3	SDR 34	SDR 21

Annex C
(Informative)
Designation of pipes and corresponding fittings

The specifier is responsible for ensuring that he or she identifies his or her requirements as follows:

Pipes

Standard	JS 2016-2 or JS 2016-3, as applicable.
Diameter	required diameter expressed either as the outside or inside diameter (DN/OD or DN/ID).
Diameter tolerance	for PP and PE only, the designation CT if the tolerance is required.
Type	required construction of the pipe expressed as either Type A or Type B.
Ring stiffness	required stiffness class expressed as SN or if applicable guaranteed minimum stiffness.
Ring flexibility	see JS 2016-2 or JS 2016-3 as applicable.
Material	required material expressed as PVC-U, PP or PE.
MFR	required MFR class of any PP pipe intended for site thermal fusion.
Application area	intended application expressed either as U if remote from the building or UD if intended for use under or close to the building.
Impact	see JS 2016-2 or JS 2016-3 as applicable.
Socket	if a short socket is required the designation "Short Socket".

Fittings

Standard	required standard either as JS 2016-2 or JS 2016-3: or one of equivalent plastics pipe standards, as applicable.
Size	diameter of the pipe with which the fitting is intended to be jointed expressed either as DN/OD or DN/ID.
Diameter tolerance	for PP and PE only the designation CT if a tighter tolerance is required.
Angle	nominal angle of any branch or bend.
Ring stiffness	required stiffness class expressed as SN or if applicable guaranteed minimum stiffness.
Material	required material expressed as PVC-U, PP or PE.
MFR	required MFR class of any PP intended for site thermal fusion.
Application area	intended application expressed either as U if remote from the building or UD, if intended for use under or close to the building.

Annex D
(Informative)
Guidance in cleaning plastics pipes

D-1 Introduction

All types of gravity drain and sewer systems require a regular cleaning regime to ensure they achieve efficient performance. The management and control of these cleaning operations are covered by EN 14654-1 [34].
This annex summarizes a recommended practice for the effective use of pressurized jetting to clean and unblock sewer pipes, while minimizing any risk of damage to the pipe system.
A brief review of other cleaning methods is also included.

D-2 Cleaning and unblocking

D-2-1 Choosing the right equipment

However, there is increasing evidence from independent jetting tests (see clause D-3), that high volume water at low pressures is a more effective way to remove obstructions and thoroughly cleanse accumulated sediments from pipes, as well as for routine maintenance. These methods use a larger bore (typically 2,8 mm) nozzles.

D-2-2 Comparing techniques

When comparing these two jetting methods, the use of high pressure/low volume jetting has the following disadvantages:
- smaller active cleaning area and volume of water, insufficient to carry debris to a manhole for removal.
- new blockage can form downstream of the area being cleaned.
- significantly increased risk of damage to the pipe wall, particularly if the pipeline is in poor condition.

This may be contrasted with low pressure/high volume jetting which has the following benefits:
- cleaning of full pipe circumference.
- significantly increased hammer action of jet-head on blockages.

Note: A 2,8 mm nozzle at 120 bar is calculated to generate approximately 5 times the energy of a 1 mm nozzle at 340 bar.

- higher volume of water flushes debris to manhole for removal.
- minimal risk of damage to pipes.

D-3 Conclusions from independent jetting tests

D-3-1 Assessing efficiency and impact

Inevitably, the question arises whether low pressures (not exceeding 120 bar, for example), are capable of achieving the necessary cleaning efficiency for typical maintenance operations.
The efficiency and impact of jetting on the various pipe materials and constructions have been explored in a variety of independent tests over recent years. These studies have been conducted under controlled conditions to ensure the testing can be fairly and consistently replicated.

D-3-2 Testing of plastic pipes

Test work and general practice throughout Europe has demonstrated that, in practice, a pressure of 120 bar is sufficient for all plastics materials. This will remove blockages likely to occur in service, while debris is carried to the manhole by high water volume.

Plastics pipe materials (PVC-U, PE and PP), in solid and structured-wall construction types, were included in an extensive laboratory testing programme and TEPPFA study. New plastics pipes, as well as those which had been in service for several years, were subjected to 120 bar water pressures with a 2,8 mm nozzle over 50 cycles without damage to the pipe.

The test parameters conform to CEN/TR 14920 [35].

D-3-3 Clearing tests

A university study first questioned jetting contractors to identify the various causes of blockages in sewer pipes and map the frequency with which these tended to occur. Of these, two of the more problematic causes were selected to be the subject of simulated clearing tests using jetting:

- Grease/fat: full bore blockage of solidified fat and disposable nappies, consistent with typical in-service operational blockages.
- Solids: one-third bore partial blockage of cured concrete, simulating residual builders' waste left in the pipe invert after installation, primarily encountered pre-commissioning of newly-installed pipes.

The pressure required to remove these blockages was measured for new plastics pipes.

Table D – 1 – Required pressure for block removal

Pressures in bar

Material	Grease	Solids
Solid and structured-wall plastics	70	Between 70 and 110

D-4 Supplementary cleaning techniques

In most situations, low pressure/high volume water jetting, in accordance with the recommended practice, is generally sufficient for the removal of blockages and efficient cleaning of plastics sewer pipes. However, for any sewer from time to time, certain other cleaning techniques may also be required, in addition to jetting, to help deal with specific situations. These include the following [1]:

a) Cleaning ball:

Spherical device, slightly smaller than the sewer pipe bore, which is passed down through the sewer. Its fluted surface creates localized turbulence and increased flow velocity adjacent to the pipe wall as it passes. This loosens, and helps release, deposited sediments.

b) Flushing:

Placing a dam or flushing valve at the upstream end of the pipe section to be cleaned in order to temporarily interrupt the flow through the sewer pipe and create flow volume build-up. When this is released, the temporary substantially-increased flow removes obstructions and loose deposits from the pipe.

c) Rodding:

Using a tool on the end of a flexible rod that is pushed (via a suitable access point) through a sewer pipe to remove blockages. Typically, only suitable for pipes up to a 250 mm nominal diameter that are no more than 2 m below ground.

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[1] The techniques a) to d) are included in EN 752-2007, Drain and sewer systems outside buildings — Sewer system management.

d) Winching:
Using a tool that is pulled on a cable through a sewer pipe between adjacent manholes to help remove obstructions or sediments. The tool is typically bucket-shaped or shaped as appropriate to the nature of the deposits. In order to minimize the risk of damage to the pipe wall, the procedure begins with a small-sized tool/bucket. This may be subsequently increased in size up to the maximum for the size of pipe concerned. A cleaning pass through the pipe is usually made in both directions.
The following technique is also used.
e) Root cutters:
Mechanical tools to remove roots that have penetrated a sewer pipe through cracks or displaced joints. Tools may be cutters or rotating chains, however, these carry a high risk of severe damage to the pipeline and will only provide a temporary solution because the roots will grow back. Only replacement of the affected section of the pipeline and/or removal of the trees concerned can provide a long-term solution.
Safety Note: Personnel entry to sewer systems is not generally recommended. If necessary, all health & safety regulations should be observed. If the flushing technique is used, it is especially important to ensure that no personnel are present in sewers downstream.

D-5 Recommended practice principles for jetting

To achieve efficient cleaning and unblocking of plastics sewer pipes, the following practice principles are recommended.
a) Personnel:
Jetting equipment should only be used by trained personnel.
b) Preparatory:
1) Evaluate, as far as possible, the nature and condition of the sewer to be cleaned, including:
- material type and size.
- structural condition.
- operational condition: flow performance and nature of deposits/blockage(s).
2) Evaluate the associated health and safety factors, particularly in relation to regulations concerning personnel entry into confined spaces.
c) Jetting equipment:
1) Use low pressure/high volume jetting.
2) Avoid high pressure/low volume cleaning techniques.
3) Select nozzle size appropriate to jetting equipment and size of pipe.
d) Jetting pressure/flow rate
1) Maximum pressure at nozzle: 120 bar.
Note: 60 bar is sufficient to remove soft debris. 80 bar to120 bar may be required to remove a more substantial build-up of material.
2) Recommended draw-back speed: 6 m/min to 12 m/min.
e) After jetting:
1) Review the operational condition of the cleaned pipe.
2) If jetting was used to clear a blockage, use CCTV to investigate the possible cause of the blockage that had to be cleared, for example, was it due to structural problems/defects (e.g. cracking or collapse)?
Report and record any information, which may be useful for future maintenance or refurbishment works.

Annex E
(Informative)
Bibliography

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