

# GENERAL SPECIFICATION

## PIPELINES - RISERS

### GS EP PLR 320

**High Density Polyethylene (HDPE) - PE 100 Pipelines  
Design, Manufacturing, Construction and Integrity  
Management**

|      |         |                                    |
|------|---------|------------------------------------|
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## Contents

|                                                                         |           |
|-------------------------------------------------------------------------|-----------|
| <b>1. Scope .....</b>                                                   | <b>4</b>  |
| <b>2. Reference documents .....</b>                                     | <b>4</b>  |
| <b>3. General .....</b>                                                 | <b>7</b>  |
| 3.1 Definition .....                                                    | 7         |
| 3.2 Quality Assurance / Quality Control .....                           | 7         |
| 3.3 Project Particular Specification (PPS) .....                        | 8         |
| <b>4. Inspection by the Company .....</b>                               | <b>8</b>  |
| <b>5. Design .....</b>                                                  | <b>9</b>  |
| 5.1 Definitions .....                                                   | 10        |
| 5.2 Design coefficients .....                                           | 10        |
| 5.3 Design pressure .....                                               | 10        |
| <b>6. Pipe and fittings manufacturing .....</b>                         | <b>10</b> |
| 6.1 Approval of Supplier's procedures .....                             | 10        |
| 6.2 Standards of reference .....                                        | 11        |
| 6.3 Raw materials .....                                                 | 11        |
| 6.4 Particular requirements for fittings .....                          | 12        |
| 6.5 Manufacturing Process Qualification Test (MPQT) or type tests ..... | 12        |
| 6.6 Process verification tests .....                                    | 15        |
| 6.7 Inspection and testing .....                                        | 16        |
| <b>7. Construction .....</b>                                            | <b>20</b> |
| 7.1 Approval of Supplier's procedures .....                             | 20        |
| 7.2 Laying .....                                                        | 20        |
| 7.3 Butt welding assembly qualification .....                           | 22        |
| 7.4 Electrofusion welding qualification .....                           | 24        |
| 7.5 Site assembly .....                                                 | 26        |
| 7.6 Non destructive testing .....                                       | 26        |
| 7.7 Hydrostatic test .....                                              | 28        |
| <b>8. Integrity management .....</b>                                    | <b>29</b> |



| General Specification                                                                                               |                         | GS EP PLR 320 |
|---------------------------------------------------------------------------------------------------------------------|-------------------------|---------------|
| High Density Polyethylene (HDPE) - PE 100 Pipelines<br>Design, Manufacturing, Construction and Integrity Management |                         |               |
| Rev.: 01                                                                                                            | Effective date: 05/2015 | Page: 3 of 30 |

|            |                        |    |
|------------|------------------------|----|
| Appendix 1 | Design data (PPS)..... | 30 |
|------------|------------------------|----|

## 1. Scope

This specification defines the Company general requirements for:

- Design
- Pipe manufacturing and inspection
- Field joining and inspection
- Field laying and final inspection

of high density polyethylene (HDPE) PE 100 pipelines.

Available pipe standard dimensions are given in [ISO 11922-1](#).

This specification shall be used in conjunction with a Project Particular Specification (PPS) to be made for purpose detailing the additional tests and requirements or the possible modifications to the present specification, based on the special design conditions of the pipeline project.

## 2. Reference documents

The reference documents listed below form an integral part of this General Specification.

### External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

| Reference                                | Title                                                                                                                                                      |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1/ Design</b>                         |                                                                                                                                                            |
| <a href="#">EN 12201-1</a>               | Plastic piping systems for water supply. Polyethylene (PE) - Part 1: General                                                                               |
| <a href="#">EN 1555-1</a>                | Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE) - Part 1: General                                                               |
| <a href="#">ISO 15494</a>                | Plastic piping systems for industrial application. Polybutene (PB), polyethylene (PE) and polypropylene (PP). Specifications for components and the system |
| <a href="#">ISO 9080</a>                 | Determination of the long term hydrostatic strength of thermoplastics materials in pipe form by extrapolation                                              |
| <b>2/ Manufacturing</b>                  |                                                                                                                                                            |
| <a href="#">EN 12201 (Parts 2; 3; 4)</a> | Plastics piping systems for water supply - Polyethylene (PE) - Part 2: Pipes                                                                               |
| <a href="#">EN 1555 (Parts 2; 3; 4)</a>  | Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE) - Parts 2; 3; 4                                                                 |
| <a href="#">ISO 4427-2</a>               | Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 2: Pipes                                                            |

| Reference                | Title                                                                                                                                                                     |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ISO 4437                 | Buried polyethylene (PE) pipes for the supply of gaseous fuels - Metric series - Specifications                                                                           |
| <b>3/ Testing</b>        |                                                                                                                                                                           |
| ASTM D3839               | Standard Guide for Underground Installation of "Fiberglass" (Glass-Fiber Reinforced Thermosetting-Resin) Pipe                                                             |
| ASTM D3849               | Standard Test Method for Carbon Black-Morphological Characterization of Carbon Black Using Electron Microscopy                                                            |
| ISO 1133-1               | Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 1: Standard method (ISO 1133-1:2011)                   |
| ISO 11357-6              | Plastics — Differential scanning calorimetry (DSC) — Part 6: Determination of oxidation induction time (isothermal OIT) and oxidation induction temperature (dynamic OIT) |
| ISO 1167 (Parts 1; 2)    | Thermoplastics pipes for the conveyance of fluids - Resistance to internal pressure - Test method - Parts 1; 2                                                            |
| ISO 1183 (Parts 1; 2; 3) | Plastics - Methods for determining the density of non-cellular plastics – Parts 1; 2; 3                                                                                   |
| ISO 13477                | Thermoplastics pipes for the conveyance of fluids - Determination of resistance to rapid crack propagation (RCP) - Small scale steady state test (S4 test)                |
| ISO 13478                | Thermoplastics pipes for the conveyance of fluids - Determination of resistance to rapid crack propagation (RCP) - Full scale test (FST)                                  |
| ISO 13479                | Polyolefin pipes for the conveyance of fluids - Determination of resistance to crack propagation - Test method for slow crack growth on notched pipes (notch test)        |
| ISO 13953                | Polyethylene (PE) pipes and fittings - Determination of the tensile strength and failure mode of test pieces from a butt-fused joint                                      |
| ISO 13954                | Plastics Pipes and Fittings - Peel Decohesion Test for Polyethylene (PE) Electrofusion Assemblies of Nominal Outside Diameter Greater Than or Equal to 90 mm              |
| ISO 13955                | Plastics Pipes and Fittings - Crushing Decohesion Test for Polyethylene (PE) Electrofusion Assemblies                                                                     |
| ISO 15512                | Plastics - Determination of water content                                                                                                                                 |
| ISO 18553                | Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds                                                 |
| ISO 2505                 | Thermoplastics pipes - Longitudinal reversion - Test method and parameters                                                                                                |

| Reference                               | Title                                                                                                                                                        |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ISO 6964                                | Polyolefin pipes and fittings - Determination of carbon black content by calcination and pyrolysis - Test method and basic specification                     |
| ISO/DIS 13956                           | Plastics pipes and fittings -Determination of cohesive strength-Tear test for polyethylene (PE) Assemblies                                                   |
| XP CEN/TS 1555-7                        | Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Guidance for the assessment of conformity                                        |
| <b>4/ Construction and installation</b> |                                                                                                                                                              |
| EN 1555-5                               | Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Fitness for purpose of the system                                                |
| ISO 12176 (Parts 1; 2; 3; 4)            | Plastics pipes and fittings - Equipment for fusion jointing polyethylene systems - Parts 1; 2; 3; 4                                                          |
| <b>5/ Non destructive examination</b>   |                                                                                                                                                              |
| ISO 9712                                | Non-destructive testing - Qualification and certification of NDT personnel                                                                                   |
| ISO 11699-1                             | Non-destructive testing - Industrial radiographic film — Part 1: Classification of film systems for industrial radiography                                   |
| ISO 1027                                | Radiographic image quality indicators for non-destructive testing                                                                                            |
| ISO 11922-1                             | Thermoplastics pipes for the conveyance of fluids - Dimensions and tolerances - Part 1: Metric series                                                        |
| <b>6/ Quality assurance</b>             |                                                                                                                                                              |
| EN 13067                                | Qualification testing of welders - Thermoplastics welded assemblies                                                                                          |
| XP CEN/TS 1555-7                        | Plastics piping systems for the supply of gaseous fuels. Polyethylene (PE). Guidance for the assessment of conformity                                        |
| ISO TS 29001                            | Petroleum, petrochemical and natural gas industries - Sector-specific quality management systems - Requirements for product and service supply organizations |
| ISO 11413                               | Plastics pipes and fittings - Preparation of test piece assemblies between a polyethylene (PE) pipe and an electrofusion fitting                             |
| ISO 11414                               | Plastics pipes and fittings - Preparation of polyethylene (PE) pipe/pipe or pipe/fitting test piece assemblies by butt fusion                                |
| ISO 13480                               | Polyethylene Pipes - Resistance to Slow Crack Growth - Cone Test Method                                                                                      |

## Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

| Reference      | Title |
|----------------|-------|
| Not applicable |       |

## 3. General

### 3.1 Definition

Throughout this specification, the following definitions apply:

|                  |                                                                                                                                                                                                                                                                                                                            |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purchaser</b> | Means the Company or the Supplier (as applicable), which have placed the Purchase Order to the Manufacturer.                                                                                                                                                                                                               |
| <b>Inspector</b> | Means the Company's representative(s) of member(s) from an Inspection Agency duly appointed by the Company or the Supplier (as applicable) to act as its representative(s) for the purpose of the contract.                                                                                                                |
| <b>Approval</b>  | Means the authorisation in writing given by the Company to the Supplier to proceed with the performance of a specific part of the work without releasing in any way the Supplier from any of its obligations or liabilities under the contract or at law; Approve, Approved and Approval shall be constructed accordingly. |
| <b>May</b>       | Used to indicate that a provision is optional.                                                                                                                                                                                                                                                                             |
| <b>Shall</b>     | Used to indicate that a provision is mandatory.                                                                                                                                                                                                                                                                            |
| <b>Should</b>    | Used to indicate that a provision is not mandatory but is recommended as good practice.                                                                                                                                                                                                                                    |
| <b>PPS</b>       | Designates the Project Particular Specification.                                                                                                                                                                                                                                                                           |
| <b>Batch</b>     | Material produced in the same manufacturing run.                                                                                                                                                                                                                                                                           |

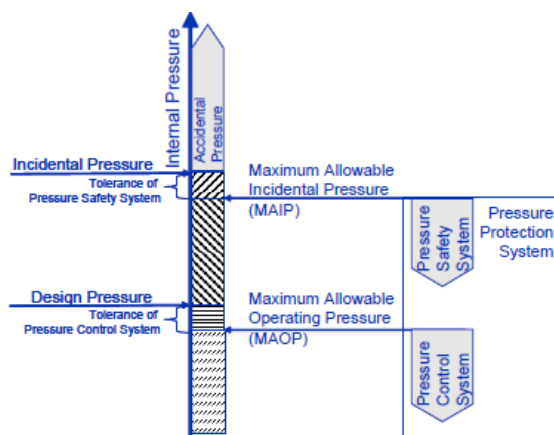
### 3.2 Quality Assurance / Quality Control

1. The Suppliers shall operate a Quality Assurance system in accordance with [ISO/TS 29001](#), approved by a recognised authority. The Quality Assurance Manual shall be submitted prior to the start of work.
2. Four weeks prior to the commencement of pipe manufacturing, the Supplier shall prepare and submit a Quality Control Plan which describes the inspections to be performed during the supply of pipes. The Quality Control Plan shall set forth "witness", "hold", "review", and "random" points.
3. Just before production starting, mill QA Representative accompanied by Inspector shall check at every production and inspection station, that the relevant working instructions and procedures are available, complete, conform to the procedures agreed by Company or to Company specification requirements. A report shall be issued by Supplier, signed by Inspector and enclosed with the final dossier.

### 3.3 Project Particular Specification (PPS)

The following information shall be provided in the PPS (see also proposed table in Appendix 1):

1. Effluent chemical composition
2. Application: water or gas transportation
3. Type of pipe: HDPE
4. Grade: only PE100 is allowed. Please note that PE100RC (i.e. with improved resistance to slow crack growth) shall be the recommended material for non conventional pipe installation (no sand bed or trenchless installation for example)
5. Field layout drawings including isometrics
6. Maximum Allowable Incidental Pressure (definition is given on the following sketch) which will stands for "system design pressure" for design calculations



7. Design temperature: shall not exceed 40°C
8. Design life: shall not exceed 50 years
9. Pipe geometry (OD and WT)
10. Live (LL) and dead (DL) loads if any
11. Occurrence of cyclic loading and corresponding amplitude ( $F_{min}$ ,  $F_{max}$  and  $\Delta F$ ) and frequency (f)
12. Joining: only butt welding and electrofusion fittings are acceptable
13. Requirements for fire performance (if any)
14. Requirements for static electricity check (if any)
15. Requirements for low temperature application (if relevant)
16. Requirement for beam deflection test (mainly for unburied pipelines).

### 4. Inspection by the Company

1. All procedures shall have prior approval of TEC/PLR Company department. All qualification tests shall take place under the supervision of the Inspector.

High Density Polyethylene (HDPE) - PE 100 Pipelines  
Design, Manufacturing, Construction and Integrity Management

Rev.: 01

Effective date: 05/2015

Page: 9 of 30

2. The Supplier shall notify the Inspector sufficiently in advance to enable him to be present at qualification tests and at all other tests or stages of manufacture subject to acceptance in accordance with this specification.
3. The Supplier shall ensure that the Inspector has full and free access to all parts of the Mill during all fabrication and inspection stages.
4. The Inspector shall ensure that materials and pipes are fabricated in accordance with all the specified requirements and Company's approved procedures.
5. At pipe mills: offices, workshops, storage yards etc., information on paper and/or in computers (procedures, working instructions, data, records, tracking system, etc.) concerning the order manufacturing and inspection, shall be made fully available and comprehensible to Inspector reading. Where the mill country language is not English, all these information shall be written in double language, i.e. mill country language and English language.
6. It shall be made available in the Inspector office, a free access to the mill computerized system:
  - Tracking system of production and inspection
  - All data and results of mechanical tests, NDE results...
  - Any other information considered pertinent by the Inspector for his monitoring
  - Computer, software environment compatible with the mill software, software interface where necessary for data exploitation with EXCEL shall be made available by the Supplier
  - Company's Inspector shall be provided with facilities/equipments for sending and receiving faxes, communicating by emails and fast Internet access.
7. Inspection by the Inspector shall be carried out during pipe production in order to avoid any special or additional handling. Inspection will be made in such a manner to avoid delay in pipe production insofar as the pipes which are presented to him meet the specified requirements.
8. The Inspector shall finalize (when required) its inspection by the application of a special stamp (to be mutually agreed with the Manufacturer).
9. The Inspector shall notify the Company without delay of any difficulty, irregularity, problem or delay likely to occur during pipe production.
10. The Company reserves the right to check tests carried out by the Supplier. For this purpose, the Company may request the delivery of the corresponding samples or specimens to be analyzed in an independent laboratory chosen by the Company.

## 5. Design

Design shall be performed following [EN 12201-2](#) for water applications and [EN 1555-2](#) for gas applications requirements and the following recommendations. The pipe Manufacturer is required to check design calculations and to propose changes when it is required.