



**Requirements for the Use of
Rework Materials in Manufacturing of
Polyethylene Gas Pipe
TN-30/2013**

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The Plastics Pipe Institute

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TN-30

Requirements for the use of Rework Materials in Polyethylene Gas Pipe

1.0 SCOPE AND PURPOSE

This technical note offers guidance and requirements for polyethylene gas pipe manufacturers and provides criteria for evaluation of manufacturers by purchasers of polyethylene gas pipe, with respect to the use of rework of polyethylene materials in the manufacture of ASTM D 2513 polyethylene gas pipe. These requirements address the cleanliness of rework polyethylene materials used in the manufacture of ASTM D 2513 polyethylene gas pipe to ensure that the use of rework does not compromise pipe quality. **The user should consult Title 49CFR Part 192 for the current referenced edition of ASTM D 2513.**

2.0 INTRODUCTION

The requirements in this technical note are designed to ensure the responsible use of rework materials and to ensure compliance with ASTM D 2513. In general, the requirements contained in this document reflect good rework inventory controls, good housekeeping, good manufacturing practices and good record keeping procedures. This technical note addresses only the extrusion process for pipe or tubing from polyethylene materials that are identified in ASTM D 2513, Annex A1. It does not address rework for other piping materials that are identified in ASTM D 2513.

These requirements shall be used to determine if polyethylene gas pipe is produced in facilities that have appropriate procedures for controlling the use of rework materials. A manufacturer shall be evaluated with respect to whether they comply with the rework material requirements of this technical note, ASTM D 2513, product quality, and customer expectations.

3.0 REQUIREMENTS FOR REWORK MATERIALS

In meeting ASTM D 2513 requirements, rework, sometimes called regrind, shall have specific characteristics:

3.1 Rework shall be clean

A manufacturer shall have a documented procedure governing the use of rework materials. At a minimum, there shall be written procedures and instructions for the responsible use of rework in a manufacturer's production process. Rework processes and procedures shall be designed to maintain virgin and rework material cleanliness, to avoid introducing contamination, and to remove inadvertently introduced contamination.

3.2 Rework shall be equal to or better than the material designation of the virgin material with which it is used

Rework processes and procedures, shall ensure that the source of rework material is from material with the same or higher PPI listed Hydrostatic Design Stress (HDS) at 73°F and have the same or higher elevated temperature HDB at 140°F, as the virgin material with which it is used (e.g. PE4710 can be used with PE4708, but PE4708 cannot be used with PE4710).

3.3 Rework shall be generated in the manufacturer's own production

Rework materials must originate in the manufacturer's own pipe¹ production facilities. A manufacturer may transfer rework among its own facilities provided it is managed in accordance with these requirements and is properly labeled and documented.

Materials from other outside sources are prohibited.

3.4 Pipe that is not suitable for use as rework

In addition to the above, rework pipes having any of the following conditions should not be used:

- Unknown thermal history
- Prolonged barrel residence time
- Excessive melt temperature that may cause degradation contamination be identified
- Non-black polyethylene pipe stored outdoors for over two years from date of manufacture is not suitable for use as a rework
- Rework pipe that cannot be cleaned is not suitable for use as rework
- Processed rework materials that becomes contaminated and cannot be adequately cleaned shall not be used

4.0 SOURCES OF REWORK

During the manufacturing process, there are several circumstances that result in the generation of pipe that is not directly saleable but is otherwise suitable for use as rework. Examples include:

- Startup
- Samples for quality control and quality assurance
- Production changeovers
- Service interruptions
- Unintentional errors and cosmetically damaged goods

¹ Some pipe manufacturers may have production operations for polyethylene piping products such as molded or fabricated fittings or feedstock for piping fabrications. The term "pipe" as used herein is inclusive of pipe and these piping product operations.

5.0 THE REWORK PROCESS

The documented rework procedure shall be designed to assure that contamination is not introduced in the rework process. For example, rework pipe must be moved from production, to size reduction that may be in several stages, to storage and then to the extruder. In-process rework material may need to be temporarily stored several times during the process. Contamination can be avoided by keeping in-process rework materials in clean areas, in clean, closed containers, by storage in specially designated areas, and by processing rework material in clean, well maintained equipment.

Good housekeeping and cleanliness in production, rework handling and storage facilities helps maintain the cleanliness of rework pipe.

Key elements of the rework process are maintaining correct material identification, preventing contamination, and proper handling and storage. Material designation identification must be maintained as the rework material moves through the rework process.

5.1 Rework Identification

According to the requirements of ASTM D 2513, pipe that is acceptable for rework must be generated in the manufacturer's own production, so that its origin can be traced to records that provide the material designation of the rework.

Rework identification and tracking may take various forms appropriate for the manufacturer's production process. Identification by color alone may not be sufficient and supplemental labeling or marking may be required on pipe intended for rework. Care shall be taken to ensure that labeling or marking does not introduce contamination.

5.2 Pipe Storage

Pipe to be used as rework shall be segregated and stored in areas that are clearly identified for rework storage.

5.3 Cleaning Pipe Prior to Grinding

Soiled or surface contaminated rework pipes shall be thoroughly cleaned before processing through the size reduction equipment.

Cleaning must remove dirt, mud, water, stones, chips and shavings and other contamination from the interior and the exterior of each piece of rework pipe. Depending on the type of contamination, cleaning procedures may range from cleaning with clean cloths to power washing. If used, surface cleaning liquids must not leave a deleterious residue or film on the surface, and must be dried off immediately. Rework materials must be dry before processing through the size reduction equipment.

Written procedures and instructions for the cleaning of pipe intended for rework are required.

5.4 Grinding of Pipe and Fittings for use as Rework

Rework pipe must be reduced to chips that can be fed into the extruder. Typically, this is a multi-stage size reduction process. Rework pipe is initially cut into shorter lengths or into sections that can be fed into additional size reduction equipment. Rework pipe is usually cut or split into sections, and depending on size, into shredding and grinding or directly into grinding equipment that reduces rework pipe sections into chips. Grinding equipment typically uses rotating blades to produce chips.

Size reduction equipment and the area around the equipment shall be kept clean, both for safety and to prevent the introduction of contamination. All cuttings and shavings are discarded as waste. Packaging materials such as plastic and steel strapping, strapping buckles and seals, plastic wrap, pipe end caps, cardboard, wood, and the like must be removed from rework pipe, from rework pipe storage areas, and discarded as waste. Care must be taken to ensure that waste materials do not enter size reduction equipment.

Where grinding and conveying equipment is not specifically dedicated to a unique material (based on the material designation), written procedures and instructions for cleaning of the grinding and conveying equipment are required to assure that cross contamination of dissimilar materials does not occur.

Dust separators shall be used in the material delivery system to remove fine particles and/or dust from the rework stream.

5.5 Storage of Rework

In order to prevent entry of foreign materials, ground rework material shall be stored in silos or covered containers dedicated to gas pipe rework use. Gaylord boxes shall be covered and fitted with plastic bag liners. Plastic bag liners shall be deep enough to fold and close over the contents. The liners shall not be reused for dissimilar materials. The rework container shall be clearly labeled with traceability information as determined by the manufacturer.

6.0 DOCUMENTATION

6.1 Documentation of Rework Procedures

The manufacturer shall have written procedures for its entire rework process and for the training of rework system operators. Rework system operator training shall be documented. The manufacturer shall be able to demonstrate that appropriate operators within a facility are trained in the proper procedures and be able to demonstrate compliance.

6.2 Production Records

The manufacturer shall maintain permanent records that identify the location of manufacture, pipe production and resin lots, and any additional information which is agreed upon by the manufacturer and purchaser. This documentation shall also include identification of the material designation and maximum percentage of rework, if any, traceable to the print line.

7.0 EXTRUSION OF PIPE UTILIZING REWORK

7.1 Amount

For the production of pipe used for natural gas distribution applications, the maximum rework percentage levels shall be in accordance with the pipe specification, but no more than 30%.

7.2 Removing Contamination During Extrusion

7.2.1 Removal of ferrous particles

Magnets shall be used near the base of the material hopper at the extruder, and near the base of other material hoppers where appropriate in the material handling system. The purpose of the magnets is to attract potential ferrous contaminants and remove them from the material stream. Manufacturers documented procedures shall include procedures to inspect and clean hopper magnets.

7.2.2 Filter the melt before it enters the pipe die

Each extruder shall be equipped with a melt filtering system (screens) capable of filtering out particles of a nominal size equal to or greater than 10% of the minimum wall thickness of the pipe. In no case shall the melt filtering system allow passage of particles larger than 0.017 inches (0.4 mm). Manufacturer's documented procedures shall include procedures for maintaining the melt filtering system and cleaning or replacing melt filter elements (screens).