FLOWTITE ORANGE
EXTREME WEAR RESISTANT GRP PIPE
FLOWTITE ORANGE is a new Flowtite pipe – developed by researchers and scientists at Flowtite Technology. Years of research and development have culminated in an extremely wear resistant pipe – tested and approved according to relevant international pipe standards.

Flowtite Orange is the third pressure pipe in the Flowtite pressure pipe portfolio. Compared to Flowtite Grey, Flowtite Orange is designed for more extreme wear exposure.

Flowtite Orange enables transport of fluids containing highly abrasive materials such as slurries from the mining industry, storm water containing extreme volumes of sand and gravel, and other applications with extreme wear exposure. Continuously wound GRP, invented by Flowtite pioneers in the late 1960s, is a flexible technology enabling engineers to apply new materials as well as developing new design and process technology. With this new pipe, Flowtite Orange, Flowtite takes yet another step ahead.

Flowtite Orange is available in Flowtite’s standard pressure, stiffness and diameter range. Please see the brochure “First Choice of Engineers” for details on pipe properties and dimensions.
WHY FLOWTITE ORANGE?

- Extreme Abrasion Resistance
- Extreme Erosion Resistance

Longer Service Life
EXTREME PERFORMANCE
FOR EXTREME WEAR EXPOSURE

WATER WITH SAND AND STONES
Some penstocks are built where it is difficult to avoid sharp riverbed stones and large quantities of sand entering the pipeline. Flowtite Orange increases lifetime when water contains extremely abrasive and erosive materials.

WATER WITH STORM WATER DEBRIS
With global warming, storm water pipelines have in recent years received far more sizable debris than earlier years. Sharp stones, timber, and other material often pass through gratings and end up tubeling down the storm water pipelines.
Flowtite Orange is designed to endure the continuous wear of slurry water used in the mining industry. The extreme wear of slurry water wears down practically all types of material. Flowtite Orange is a more durable alternative!

Special needs arise all the time. No pipeline is facing the same challenges - and for all those that can suffer damage from extreme wear - Flowtite Orange can add years to a pipelines' service life!
FLOWTITE ORANGE OFFERS highly improved wear resistance. This means that the Flowtite Orange pipe can cope with extremely abrasive particles sliding on or impacting the interior surface. A pipe with a hard liner material will offer excellent resistance toward the abrasion mode, but will be reduced in the erosion resistant capability. Vice versa, a pipe with a flexible liner is excellent toward the erosion mode, but less capable of handling the abrasion mode. Flowtite Orange is a new pipe developed to minimize wear, no matter the mode. Orange is not a compromise, but a technology that tackles both extreme erosion and extreme abrasion simultaneously.

HIGHER WEAR RESISTANCE allows engineers to transport water with of extremely abrasive and erosive substances. Typical uses of Flowtite Orange would be slurry pipelines, penstocks stormwater with unpredictable types and shapes of contaminations, and others. The modes of wear in one pipeline will constantly be changing depending on a series of variables:

- Flow velocity
- Particle loading
- Particle mass (particle size and particle density)
- Particle nature (Shape, chemical composition)
WHAT IS WEAR RESISTANCE?
Erosion and abrasion are two phenomena that are prone to cause wear. The difference of these two is seen in the figure. Where flow is laminar the abrasion mode will be pronounced, while a turbulent flow will result in particles bumping against the liner – thereby erosion. The two together Erosion and abrasion are two phenomena that are prone to cause wear.

Flowtite Orange technology was used in Laxa River in Iceland.
**FLOWTITE ORANGE IS EROSION RESISTANT**

**EROSION RESISTANCE** is a concern for many pipe installations when water contaminated with extreme quantities of sand, silt and gravel must be transported in the pipe at higher flow velocity. Erosion occur when particles impact the liner from an angle, as opposed to abrasion, which is the occurrence of particles sliding on the internal surface (liner). A liner exposed to erosion should be softer in order to handle impact over time.

The suspended solids can cause erosion and, when severe, result in structural integrity issues and may even eventually require repair or rehabilitation.

Tests conducted at the Flowtite Technology Laboratory in Norway show that Flowtite Orange has excellent erosion resistance.

Flowtite Orange's new pipe design offers better resistance to erosion for most applications with extreme wear issues.

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**DUCTILE EROSION**

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**BRITTLE EROSION**

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Erosion dramatically affects service life of pipelines. High erosion, such as can be found in slurries, can wear down a pipeline within few years, even months.

**TESTING EROSION RESISTANCE**

Slurry jet erosion at different impact angles are among the tests Flowtite Orange is subject to. Slurry Jet Erosion (22.5 ° at 10 m/s for 60 minutes with 10 wt % volcanic sand) showed a reduction of liner thickness of only 0.07 mm of the Flowtite Orange. Slurry Jet Erosion (45 ° at 10 m/s for 60 minutes with 10 wt % volcanic sand) showed a reduction of liner thickness of mere 0.18 mm of Flowtite Orange. An extremely wear resistant pipe like Flowtite Orange can extend pipeline service life significantly.

**WHY IS HIGHER EROSION RESISTANCE IMPORTANT TO ENGINEERS?**

Mining Water Processing plant. Flowtite Orange pipes are designed for extremely erosive slurry water.
**EXTREMELY ABRASION RESISTANT**

**TESTS CONDUCTED** at the Flowtite Technology Laboratory in Norway show that Flowtite Orange has excellent abrasion resistance.

Flowtite Orange’s new pipe design offers better resistance to abrasion for most applications.

The Damstadt abrasion test showed <0.03 mm liner thickness reduction after 200,000 cycles on Flowtite Orange.

**WHAT IS ABRASION RESISTANCE?**
Abrasion resistance is the resistance to internal damage on the pipe liner by suspended solids. The extent of the abrasion depends on flow velocity, concentration of the particles, chemical composition and shape of the particles.

Abrasions testing at the Flowtite Technology laboratory in Sandefjord, Norway.
ABRASION RESISTANCE
Gravel abrasion to 200 000 cycles estimated
< 0.03 mm loss in liner thickness.

WHAT DOES HIGHER ABRASION RESISTANCE MEAN TO ENGINEERS?

HIGHER ABRASION RESISTANCE permits engineers to employ Flowtite pipes in applications with heavier loads of suspended solids. Higher resistance to abrasion reduces the frequency for costly shut downs for inspection and longer periods in operation are permitted. Better abrasion resistance can mean longer operating life for the pipeline.

Wear damages on a steel pipe. Location: Iceland
THE ORANGE STANDARD
FLOWTITE ORANGE takes a big leap ahead with wear resistance. In many applications, extreme abrasive and erosive fluids, like e.g., slurry water, have shortened the lifetime of pipes down to a few years or even less than a year. Tests results and test pilots show that Flowtite Orange will endure abrasive and erosive waters and dramatically increase the life expectancy of such applications.
INVENTING THE ORANGE TECHNOLOGY

FLOWTITE ORANGE has been made possible by elastomeric thermoset chemistry and a novel way of reacting the material with GRP during the continuous winding process. This offers an integrated highly flexible liner, that does not peel under harsh conditions.

Kinera has been one of Flowtite’s research partners in the process of developing the Orange technology.
**STANDARD FLOWTITE PROPERTIES**
Flowtite pressure pipe is the most commonly used pipe for pressure and gravity applications, with a 50 year long proven track record. It is compliant with all international performance standards.

**FLOWTITE ORANGE PROPERTIES**
Flowtite Orange is a new pipe, developed for extreme wear resistance that occur in e.g., slurry pipelines, storm water and other applications where extreme wear may occur.

<table>
<thead>
<tr>
<th>Standard Properties</th>
<th>Flowtite Orange Properties</th>
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<tbody>
<tr>
<td><strong>Wear Resistance</strong></td>
<td>Good wear resistance for most applications.</td>
</tr>
<tr>
<td><strong>Abrasion Resistance</strong></td>
<td>Good resistance in most pressure and gravity applications.</td>
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<tr>
<td><strong>Erosion Resistance</strong></td>
<td>Good erosion resistance.</td>
</tr>
<tr>
<td><strong>Expected Service Life in Extreme Wear Environments</strong></td>
<td>If exposed to extreme wear, Flowtite standard pressure pipes will have not as long service life as Flowtite Orange.</td>
</tr>
<tr>
<td><strong>Flow Velocity</strong></td>
<td>Flowtite pipelines sustain intermittent velocities up to 8 m/s if the water is clean and contains no abrasive material.</td>
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LIGHTWEIGHT DESIGN MAKES HANDLING EASY
STANDARDS

Flowtite Technology has the world’s largest certified GRP pipe laboratory. Location: Norway

FLOWTITE PIPE HAS BEEN RIGOROUSLY TESTED TO VERIFY CONFORMANCE TO THE FOLLOWING INTERNATIONAL PERFORMANCE STANDARDS:

<table>
<thead>
<tr>
<th>STANDARD</th>
<th>PURPOSE</th>
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<tbody>
<tr>
<td>AWWA C950</td>
<td>Water supply</td>
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<tr>
<td>AWWA M45</td>
<td>Design manual</td>
</tr>
<tr>
<td>ISO 10639</td>
<td>Water supply</td>
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<tr>
<td>ISO 10467</td>
<td>Sewer and drainage</td>
</tr>
<tr>
<td>ISO 14692</td>
<td>Industrial piping</td>
</tr>
<tr>
<td>EN 1796</td>
<td>Water supply</td>
</tr>
<tr>
<td>EN 14364</td>
<td>Sewer and drainage</td>
</tr>
<tr>
<td>ASTM D3262</td>
<td>Sewer</td>
</tr>
<tr>
<td>ASTM D3517</td>
<td>Water supply</td>
</tr>
<tr>
<td>ASTM D3574</td>
<td>Pressure sewer</td>
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</tbody>
</table>

Flowtite pipes are additionally approved by most national standards
All you need to know about installation, couplings and fittings can be found in Flowtite company literature. This literature can be found in the brochures section at www.flowtite.com or www.amiantit.eu.

The environmental impact of Flowtite pipes has been thoroughly documented by Flowtite, and has been certified and approved by an external body. Flowtite Orange is covered by the findings in the Flowtite Environmental Product Declaration (EPD).
COUPLINGS & FITTINGS

COUPLINGS
Contact your local Flowtite supplier for advice on choosing suitable couplings for Flowtite Orange. Below are options that may be considered. For more detailed information on Flowtite couplings, please see “The First Choice of Engineers” brochure at www.flowtite.com.

Fittings are also manufactured and delivered according to the principles for ordinary Flowtite pipelines. For more information on Flowtite fittings, please see “The First Choice of Engineers” brochure at www.flowtite.com.

SUGGESTED JOINTS

PRESSURE COUPLING

BIAXIAL LOCKJOINT

LAMINATED JOINT

FLANGE
This brochure is intended as a presentation only. Flowtite has separate handbooks and manuals for engineering and installing Flowtite products, which should be used for such purposes. All values listed in the product specifications are nominal. Unsatisfactory product results or applications may occur due to environmental fluctuations, variations in operating procedures, or interpolation of data. We highly recommend that all personnel using this data have specialized training and expertise in the application of the products and their normal installation and operating conditions as well as any particular requirements and the degree of care required for product installation or service. Flowtite does its utmost to ensure that all technical information, data and recommendations are based upon good research and our wealth of experience. We provide the data in this brochure in good faith, and, as such, accept no liability, and will not be held liable, for any losses or damage which may result from the installation or use of any products listed in this brochure. Flowtite companies reserve the right to revise, delete or make obsolete any data and product featured in this brochure without prior notice. We welcome comments regarding this brochure.

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