

**Mondi Štětí a.s.**

## **STANDARD**

### **Part 10.01.05**

# **GLASS REINFORCES PLASTIC TANKS AND PIPES**

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# STANDARD

## Part 10.01.05

### GLASS REINFORCES PLASTIC TANKS AND PIPES

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## 1 General

This standard is valid mainly for pulp production, and Energy. It is possible to use it after agreement with particular operation for other activities.

STN EN 13121-1 to 4 describes products from fibre glass material. Fibre glass material is termed according to this norm as GRP (glass reinforced plastic). Older term is FRP (fibre glass reinforced plastic).

Glass reinforced plastic is composite material consists from resin and glass fibres. GRP material must have 3 main layers for usage in pulp mill:

1. layer: The chemical layer, the so called liner, that provides the product with its high internal chemical resistance.
2. layer: The mechanical layer with a high glass content that provides the product with a high mechanical strength.
3. layer: A resin rich layer that provides the external protection of the glass fibre laminate.

The most suitable composition of the layers in pulp mill is with combination of chemical and mechanical resistance in the 2<sup>nd</sup> layer. (Type-E from company Kialite Plasticon).

## 2 GRP material application depending on medium

### 2.1 Resins

They are exist some types of resins applied for GRP material. Epoxy vinyl ester resins are used in pulp mill, mainly two types manufactured by Ashland company:

#### **Type 41, Derakane 411-45 (color code type: red)**

Provides resistance to a wide range of acids and alkalis. It is applied in alkali stages in pulp mill.

#### **Type 42, Derakane 470-36S (color code type: dark green)**

Provides high resistance to acids and oxidizing substances such as chlorine.

Other types of vinyl esters resins:

#### **Derakane (Momentum) 441-350**

It is resistant to acids, alkalis, hypochlorids, bleaches and organic solvents

**Derakane (Momentum) 441-400**

It has mechanical, thermal and chemical resistance properties between Derakane 411 and Derakane 470 resins. It is resin of choice for application with thermal cycling, e.g. for reaction vessels.

**Derakane (Momentum) 510A/C**

It offers high degree of fire retardance with high fatigue resistance. It is very resistant to chemical attack by chlorine.

**Derakane 510N**

It offers high degree of fire retardance with high fatigue resistance. It is the most resistant resin against chlorine, bleach and hot, wet flue gas environments.

**Derakane 8084**

It has very high roughness, impact- and fatigue- resistance and excellent adhesion. It is the resin of choice for demanding structural applications and as a primer for chemically resistant GRP linings.

**Chemical resistance of Derakane resins**

Chemical	Concentration %	Max temperature of medium according to resin-type (°C)					
		411	441	470	510A/C	510N	8084
ClO <sub>2</sub>	all	80	90	95	90	95	
H <sub>2</sub> SO <sub>4</sub>	0,5-25	100	105	105	100	105	80
H <sub>2</sub> SO <sub>4</sub>	76-80	40	40	50	40	40	
H <sub>2</sub> SO <sub>4</sub>	>80	NR	NR	LS	NR	LS	NR
Black liquor	low	80	80	80	80	80	
Black liquor	high	95	105	105	105	105	
NaOH	all	80	65	40	80	65	65
NaClO <sub>3</sub>	> 0.5	100	100	100	100	100	80

NR – not recommended by producer (forbidden in Mondi SCP)

LS – limited application (max. temperature of medium 40 °C and regular checking specified by producer)

**2.2 Pressure class of pipes**

Pipes and fittings of pressure class PN 16 are used for pressurized piping (pulp stock, filtrate).

Pipes and fittings of pressure class PN 6 are used for non-pressurized piping for venting (vapour).

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### **3 Documentation from producer**

Producer (supplier) of GRP pipes and tanks must submit next documentation together with delivery:

#### **3.1 Documentation for pipe**

- Drawing documentation (basic dimensions of the product, particular layers of the wall, specification of used materials)
- Material certificates (glass fibres, resins, additives)
- Certificate of conformity

#### **3.2 Documentation for tank**

##### **3.1.1 Quality plan**

- Documentation from continuous test of quality during production in the manufacturing mill.

##### **3.1.2 Technical documentation**

- Drawing documentation (dimensions of the product, particular layers of the wall, specification of used materials)
- Static calculations (of tank)
- Material certificates (glass fibres, resins, additives)
- Certificates of workers of producer
- Dimensional test before expedition
- Certificate of conformity
- Test protocols (of strength, of hardening, etc.)
- Structural and accessory documentation of pressure vessels must be delivered according to public notice No. 718/2002 annex No. 3
- It is necessary to mention number of the tank in drawing and accessory documentation, which is given by deputy of appropriate professional department  
(example: 07\_T\_076)

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## **4 Delivery and installation of GRP vessels**

According to STN EN 13121-4 and for pressure vessels also according to public notice No. 718/2002

### **4.1 Inspection before delivery**

It is necessary to provide by inspection before delivery:

- Inspection certificate;
- Right identification of the vessel;
- Specified condition of the vessel;
- Blinding of all nozzles by operation or temporal blinds or covers.

It is necessary to provide during transport of GRP vessels:

- Temperature of current environment during transport must be higher than 5 °C;
- To secure and support by straps or ropes to avoid vessel damage;
- To use synthetic flat woven straps with loops for lifting. The narrowest width of straps must be 80 mm.

Storage, lifting, loading and transport must be according to producer instructions and according to STN EN 13121-4 and must be prepared checking report about delivery - see annex „C“.

### **4.2 Inspection before installation**

It is necessary to do inspection before installation to provide that:

- a) support construction or foundation are suitable for installation;
- b) support construction or foundation are in designated tolerances;
- c) in case of necessity vessel must be protected before lowering during installation.

Deliverer is obliged to submit inspection report about installation - see annex „D“.

### **4.3 Preparation of installation place**

Tanks and vessels with flat bottom must be installed on foundation with smooth surface with total roughness 2 mm/m and maximal deflection 0,5 mm. Maximal vertical inclination is 0,5°.

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#### **4.4 Inspection after installation**

a) Visual inspection must indicate general condition of tank or vessel, condition of material, walls, nozzles, connections and junctions. Inspection subject is outside and inside surface. Visual inspection must be done before hydraulic or pressure test and after it.

b) Hydraulic or pressure test, safety test or tests at operation equipments, and also spark test of sheathing seams.

Conditions and inspection and test results must be recorded in writing.

### **5 Inspection of GRP vessels during operation**

According to STN EN 13121-4 and for pressure vessels also according to public notice No. 718/2002.

#### **5.1 Outside inspections**

- Each year with report preparation about operation conditions and inspection result.

#### **5.2 Inside inspections**

- According to producer instruction
- If producer didn't prescribe more often inspection than time schedule of inspections is next:
  - inside inspection must be done after 5 years
  - next inspections regularly each 2 years.

In problem cases (abrasive medium, high temperature close to max. safety temperature, at partial damaging determined by last inspection) each year.
- It is made report about operation condition and about inspection result.



## 6 Supports for GRP pipes

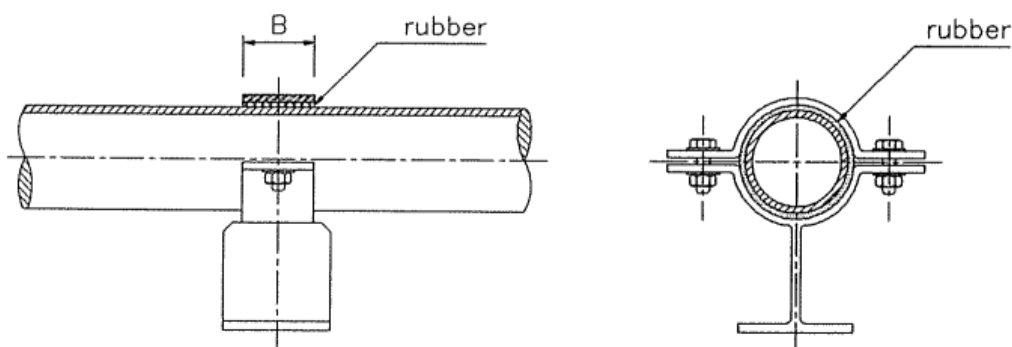
It is necessary to use rubber pad with hardness 50-60° shore inside the clamp to provide free axial movement of GRP pipe. The clamp must have minimal width (dimension B) according to next table:

Diameter of pipe DN (mm)	25	32	40	50	65	80	100	125	150	200	250	300	350	400
Min. width of clamp B (mm)	25	25	25	32	32	32	40	40	50	75	100	100	120	140

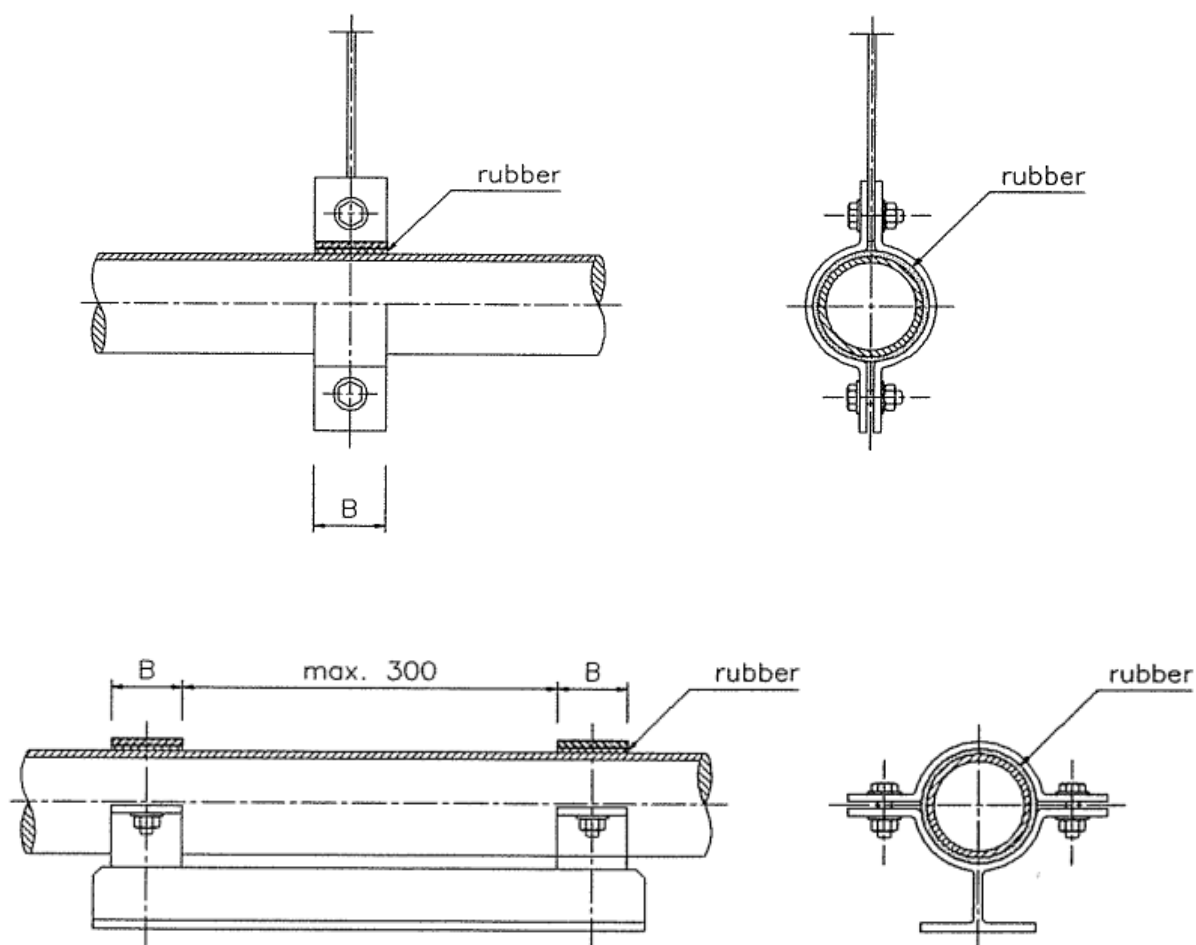
The clamps should be used:

- At pipe line systems where connection is not designed for transfer of bending forces
- On both sides at each reverse of pipe direction
- On both sides of each anchored valve or pump
- On both sides of compensator or expanse loop

Examples of pipe supports:



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## Annex C (according to STN EN 13121-4)

### Inspection report about delivery

Inspection report about delivery	
Tank/vessel: .....	
Producer: .....	Production place: .....
Tank/vessel number: .....	Production date: .....
Customer: ..... Address: .....	
Customer number: ..... Date: .....	

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Printouts, if any, are not controlled.

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Transporter:..... Address: ..... Truck identification number:..... Loading place: ..... Delivery place: ..... Driver name: .....	
<b>Inspection company: ..... Inspector: .....</b>	
<b>Inspections before loading:</b> <span style="float: right;"><b>yes / no</b></span>	
Tank/vessel checked and clean before loading .....	<input type="checkbox"/> <input type="checkbox"/>
Track is suitable for tank/vessel transport.....	<input type="checkbox"/> <input type="checkbox"/>
Area is cleaned/supports for loading.....	<input type="checkbox"/> <input type="checkbox"/>
Loading condition accepted.....	<input type="checkbox"/> <input type="checkbox"/>
Acceptation of inspection for loading      checked by:.....	<input type="checkbox"/> <input type="checkbox"/>
<b>Inspections after loading:</b>	
Tank/vessel without visible damage .....	<input type="checkbox"/> <input type="checkbox"/>
Tank/vessel supported and secured.....	<input type="checkbox"/> <input type="checkbox"/>
Tank/vessel cleaned for expedition .....	<input type="checkbox"/> <input type="checkbox"/>
Acceptation of inspection for expedition      checked by: .....	<input type="checkbox"/> <input type="checkbox"/>
Place and date: ....., .....	
<b>Inspection company: ..... Inspector: .....</b>	
<b>Inspections before unloading:</b>	
Tank/vessel without visible damage .....	<input type="checkbox"/> <input type="checkbox"/>
Supports and safety measures are suitable .....	<input type="checkbox"/> <input type="checkbox"/>
Cleaned foundation for storing/installation.....	<input type="checkbox"/> <input type="checkbox"/>
Suitable conditions for unloading.....	<input type="checkbox"/> <input type="checkbox"/>
Acceptation of inspection for unloading      checked by: .....	<input type="checkbox"/> <input type="checkbox"/>
<b>Inspection after unloading:</b>	
Tank/vessel without visible damage .....	<input type="checkbox"/> <input type="checkbox"/>
Tank/vessel is oriented horizontally/vertically .....	<input type="checkbox"/> <input type="checkbox"/>
Tank/vessel supported and secured .....	<input type="checkbox"/> <input type="checkbox"/>
Acceptation of installation of tank/vessel      checked by: .....	<input type="checkbox"/> <input type="checkbox"/>
Place and date: .....	

Attached:

Distribution list: Producer/transporter/customer

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## Annex D (podľa STN EN 13121-4)

### Inspection report about installation

Inspection report about installation	
Tank/vessel: ..... Producer: ..... Production place: ..... Tank/vessel number: ..... Production date: .....	
Customer: ..... Address: ..... Customer number: ..... Date: .....	
Fitter: ..... Address: ..... Fitter approved: ..... Date: ..... Place of installation: ..... Place of foreman: .....	
<b>Inspection company: ..... Inspector: .....</b>	
<b>Inspections before installation:</b> <span style="float: right;"><b>yes / no</b></span>	
Placing of tank/vessel with drawing no.....	Date ..... <input type="checkbox"/> <input type="checkbox"/>
Checked and clarified installation instructions	..... <input type="checkbox"/> <input type="checkbox"/>
Nozzles are properly blinded/covered	..... <input type="checkbox"/> <input type="checkbox"/>
Totally supported with/without balancing material/pads	..... <input type="checkbox"/> <input type="checkbox"/>
Facilities/equipments checked and cleaned	..... <input type="checkbox"/> <input type="checkbox"/>
Installation conditions accepted/ambient temperature: ..... °C	
Acceptation before installation	checked by: ..... <input type="checkbox"/> <input type="checkbox"/>
<b>Inspections during installation:</b>	
Procedure of lifting in accordance with ..... according to annex A/B .....	<input type="checkbox"/> <input type="checkbox"/>
Balancing material/used pads	..... <input type="checkbox"/> <input type="checkbox"/>
Suitable lifting equipments	..... <input type="checkbox"/> <input type="checkbox"/>
Lifting without incidence or another mistakes	..... <input type="checkbox"/> <input type="checkbox"/>
Acceptation of installation	checked by: ..... <input type="checkbox"/> <input type="checkbox"/>
<b>Inspections after installation:</b>	
Tank/vessel is in right position and in standard tolerances	
Anchor bolts are according to drawing	..... <input type="checkbox"/> <input type="checkbox"/>
Installed outside/inside accessories	..... <input type="checkbox"/> <input type="checkbox"/>
Acceptation of inside layers	..... <input type="checkbox"/> <input type="checkbox"/>
Nozzles are blinded/covered	..... <input type="checkbox"/> <input type="checkbox"/>
Acceptation of outside layers	..... <input type="checkbox"/> <input type="checkbox"/>
Acceptation of installation of tank/vessel	checked by: ..... <input type="checkbox"/> <input type="checkbox"/>
Place and date: .....	

Attached: Distribution list: Producer/transporter/customer

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