

|                               |   |          |
|-------------------------------|---|----------|
| <b>Unipetrol RPA, s.r.o.</b>  | <b>Acceptable weld classification levels and extent</b> | N 15 010 |
| Technical Services<br>Section | <b>radiation or ultrasound weld tests</b>               |          |

The standard shall be binding for all company units and external companies that are responsible for determining the extent and classification of non-destructive testing of welds at ORLEN Unipetrol RPA, s.r.o. Furthermore, it does not apply to the Litvínov and Kralupy Refineries either.

The units are obliged to acquaint all external companies that conduct these activities for them with the standard. The standard shall be also binding for these external companies.

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## 1. General stipulations

### 1.1 Scope of validity

The standard is used for determining acceptable classification levels. It determines the extent of weld inspections for devices exposed to internal or external excessive pressure at ORLEN Unipetrol RPA, s.r.o.

|  |   |                                  |
|--|---|----------------------------------|
| <b>Replaces:</b><br>N 15 010 from 1. 7. 2001 | <b>Standard administrator:</b><br>Maintenance support section | <b>Valid from:</b><br>5. 4. 2017 |
|--|---|----------------------------------|

- 1.2 Managers at the corresponding management level and pursuant to their respective job descriptions shall be responsible for securing and complying with the given parts of this standard.

## **2. Determination of acceptable classification weld levels and of the extent of radiation or ultrasound tests**

- 2.1 Shall the drawing documentation of a produced device or spare part include a weld classification level and test extent, these data shall be used for non-destructive testing.
- 2.2 For spare parts delivered pursuant to externally prepared drawing documentation, the ordering unit is obliged to determine the acceptable classification level and the extent of the required weld inspection in compliance with Point 2.6 of this standard. The purchasing department is obliged to incorporate this requirement in the process of concluding corresponding purchase contracts.
- 2.3 Shall the devices in question be delivered by external suppliers as an investment unit, the investor shall be obliged to apply this standard when securing the project.
  - 2.3.1 Shall the delivery include welded devices for production sets, technology of which has not been introduced at Unipetrol RPA yet, the investor shall be obliged to consult the issue of the weld classification levels and of the extent of weld testing with employees of the technical services section, who shall, if necessary, determine further weld quality requirements.
  - 2.3.2 Shall an external supplier refuse to conclude a contract for the purpose of compliance with this standard, such a case shall be consulted with employees of the technical services section.
- 2.4 For maintenance works conducted without drawing documentation, the weld classification levels and the extent of weld testing shall be determined by the given maintenance technician.
- 2.5 The acceptable classification level and the extent of weld testing for industrial metal pipelines are determined for individual operation substances pursuant to ČSN EN 13 480-1- 5, Industrial metal pipelines. In the case of pressure bottles, proceed pursuant to ČSN 69 0010 and ČSN EN 13 445.
- 2.6 Acceptable weld classification levels and the extent of weld testing are determined pursuant to this standard while considering the given substance type, highest operation overpressure, operation temperature, dimensions of individual parts pursuant to the attached pictures 1 through 4 for pipes and, if applicable, pursuant to the table of acceptable classification levels for stable pressure containers.

- 2.6.1 Pictures 1 through 4 apply to all materials with the exception of those stated in Article 2.6.5.
- 2.6.2 From the perspective of standard N 11 986, “Standard for technical documentation, testing and accepting distribution pipelines”, pictures 1 and 2 apply to operation media, pipelines of which are assigned to group I or II of distribution pipelines - distribution pipelines with hazardous substances, malfunctions of which can endanger people and environment of which is characterized as an increased risk environment.
- 2.6.3 From the perspective of standard N 11 986, “Standard for technical documentation, testing and accepting distribution pipelines”, pictures 3 and 4 apply to operation media, pipelines of which are assigned to group III or IV - pipelines with other operation media.
- 2.6.4 The tables show individual operation condition limits, to which the given acceptable classification level and extent of weld testing apply for the given area. The first number signifies the acceptable weld classification level pursuant to ČSN EN ISO 10 675 - 1 and ČSN EN ISO 17 636 – 1. The second number represents the minimal percentage of the length of all weldment welds that have to be inspected from the total length of the welds implemented on a given comprehensive piece of work by a single welder. Shall a welder be welding multiple products to which the same weld classification levels and the extent of weld testing apply, the percentage of the inspected weld length can be determined from the sum of the lengths of all weldments that the welder welds under the same conditions within a maximum period of one week. In this case, the actual inspection shall be spread out as evenly as possible among individual weldments.
- 2.6.5 For weld inspections by the means of ultrasound testing, the acceptable classification level is determined pursuant to ČSN EN ISO 17 640 (the standard specifies four testing classes – A, B, C and D). In the case of Unipetrol RPA, s.r.o., it is recommended to primarily use class B and to utilize method 2 pursuant to ČSN EN ISO 11666, classification level 2 (A12). All testing classification changes should be consulted with the material and nondestructive testing department. The extent of the testing is governed by Article 2.6.4.
- 2.6.6 Pictures 1 through 4 also apply to materials that need to be preheated prior to welding, class 17 materials and plated materials, however, with the stipulation that the minimal inspection extent is 10% of the number of welds from each welder.
- 2.6.7 For pressure container welds, the weld coefficient of which has been determined to be (for example, on the given drawing) greater than 0.7, the acceptable classification level shall be determined pursuant to the table of acceptable classification levels. Shall the values determined in this manner not be identical, the stricter criterion shall apply for the inspection.

- 2.7 Shall the specified percentage of inspected welds correspond to a smaller number of welds than one, at least one weld shall be inspected.
- 2.8 Shall the welds in question be not only transverse but also longitudinal, most of the inspected welds shall be longitudinal welds.

### 3. Radiation or ultrasound weld tests

- 3.1 Assigning welds into classification levels is prescribed in the drawing documentation. When it is not, the classification level should be determined by the device maintenance technician pursuant to Point 2.6 of this standard.
- 3.2 Welds are especially inspected when the biggest weld defects can be expected (for example, weld ends, connections of two welds, closing welds, welds implemented in difficult positions, etc.).
  - 3.2.1 The given part manufacturer is obliged to provide a document on the weld inspection results to a representative of the appropriate Unipetrol RPA department (section). This representative also monitors compliance with the required percentage of the inspected parts.

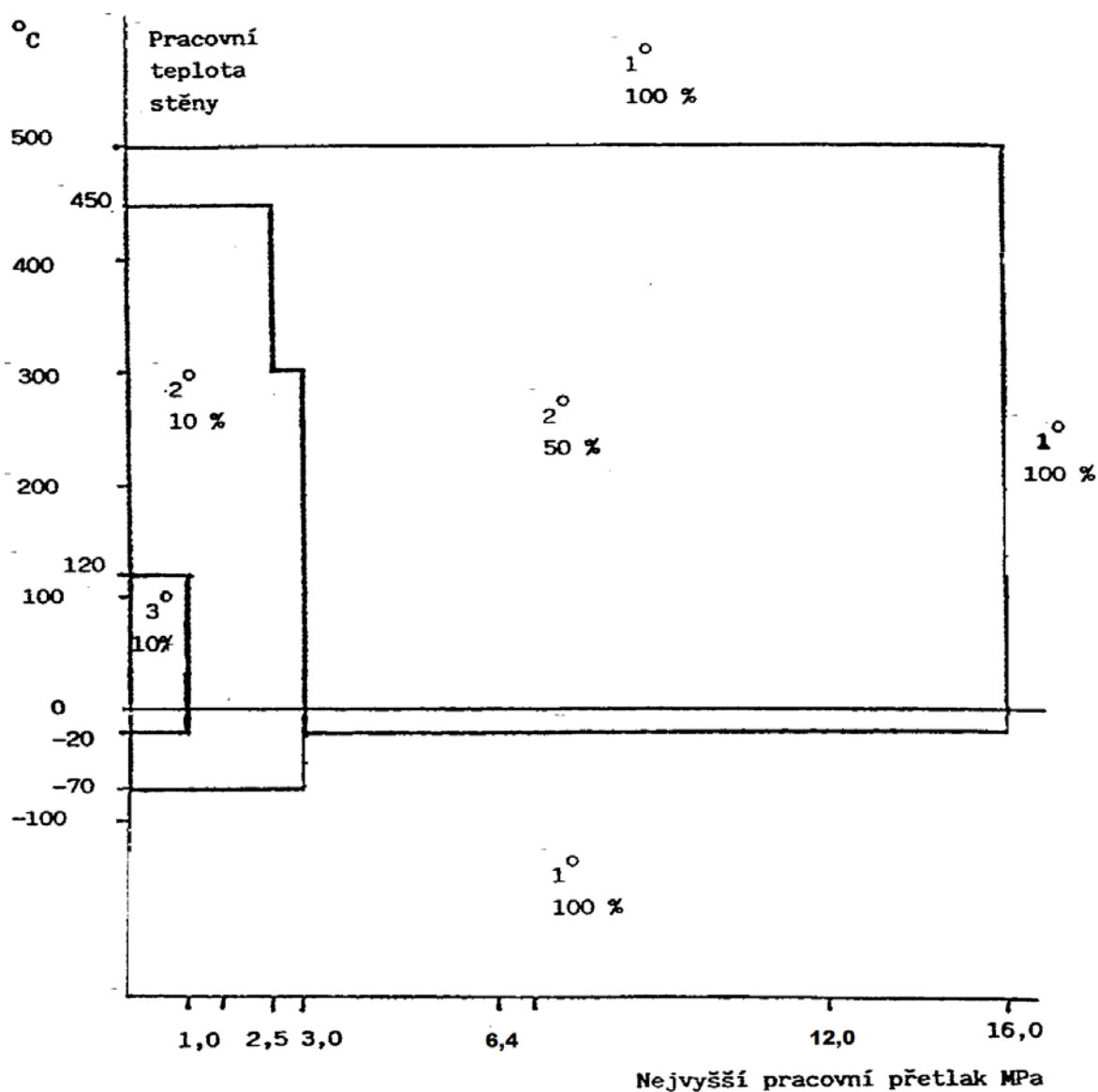
Shall an unsatisfactory weld be determined, the percentage of inspected welds should be doubled. Shall this extended inspection determine yet another unsatisfactory weld (even a single one), all welds must be inspected.

- 3.3 Inspection of compliance with the acceptable weld classification level and test extent for devices and parts supplied by external suppliers shall be secured by:
  - 3.3.1 Purchasing department in the case of spare parts.
  - 3.3.2 Investment section in the case of investment units.
  - 3.3.3 These units shall be obliged to obtain all radiograms and, in the case of ultrasound tests, all protocols and registration records from automated tests from the given external supplier. They shall submit these documents, together with documents that demonstrate the specified weld classification level for supervision pursuant to S 338, Input inspections of metal materials and metal products conducted by nondestructive methods.

Picture No. 1 - Acceptable weld classification levels and test extents in relation to operation pressures and temperatures of pipelines with hazardous operation media if people are endangered and if there is an increased risk environment:

Operation media of groups I and II pursuant to N 11 986

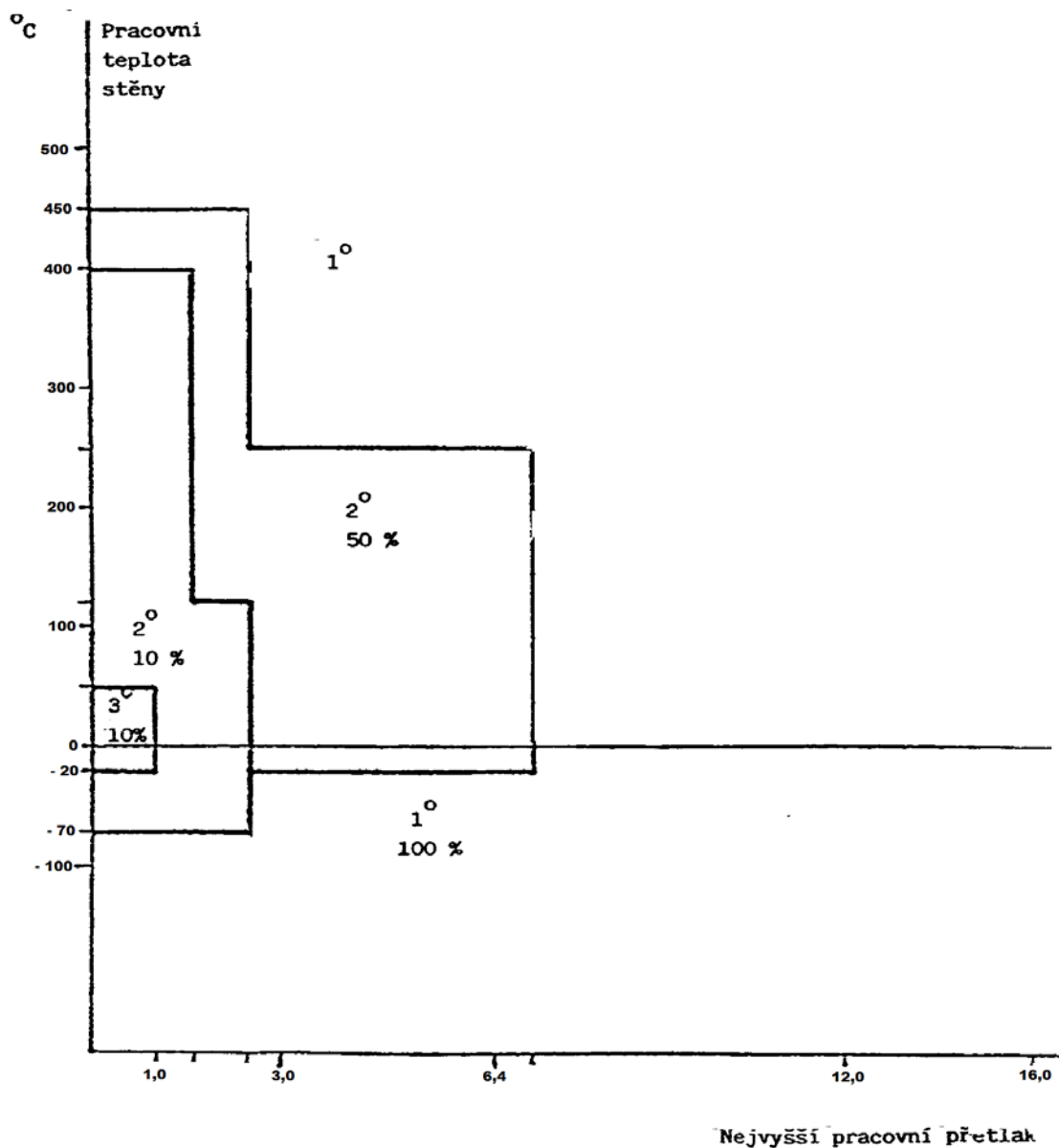
Dimension  $DN \leq 250$



Picture No. 2 -Acceptable weld classification levels and test extents of pipelines with hazardous operation media if people are endangered and if there is an increased risk environment in relation to operation pressures and temperatures.

Applies to operation media of groups I and II pursuant to N 11 986

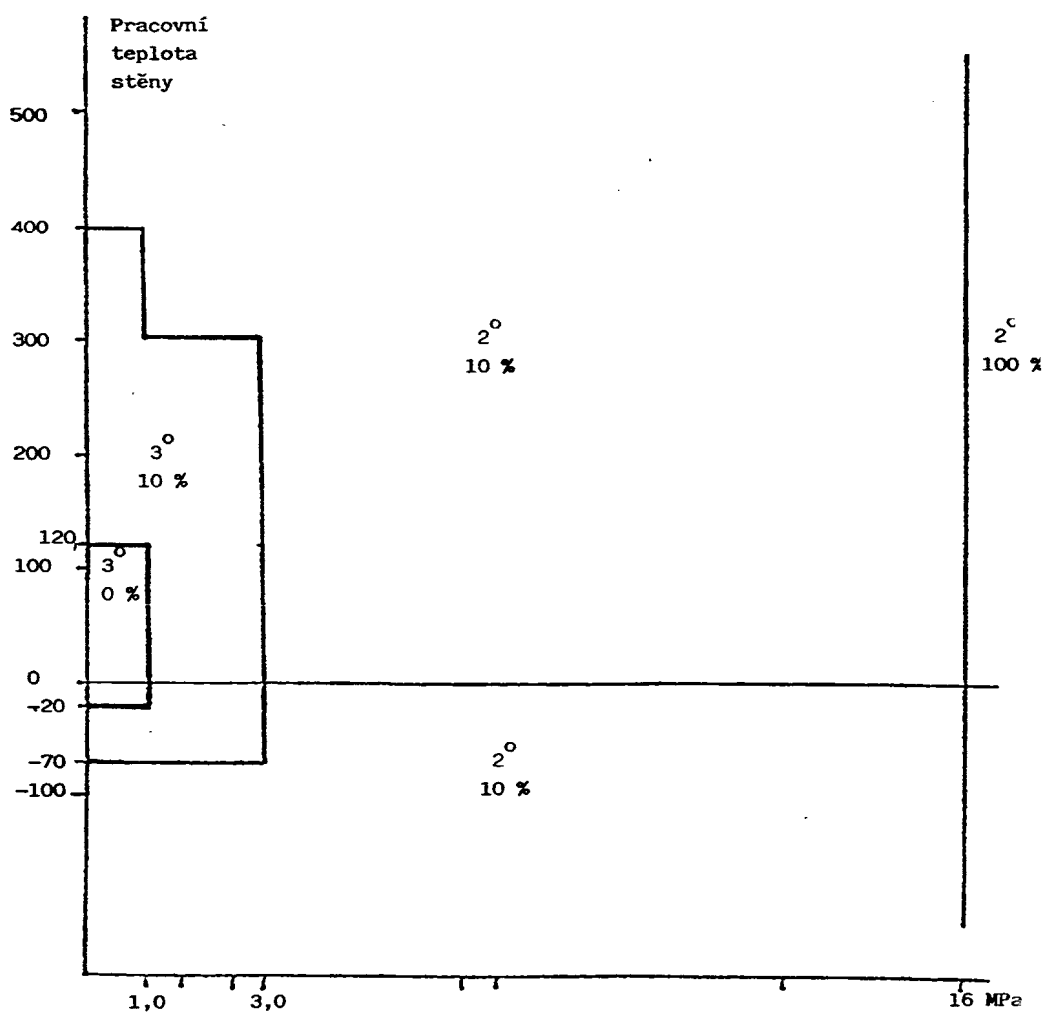
Dimension DN > 250



Picture No. 3 -Acceptable weld classification levels and test extents in relation to operation pressure - temperature for pipelines with other operation media.

Applies to operation media of groups III and IV pursuant to N 11 986

Dimension DN < 250

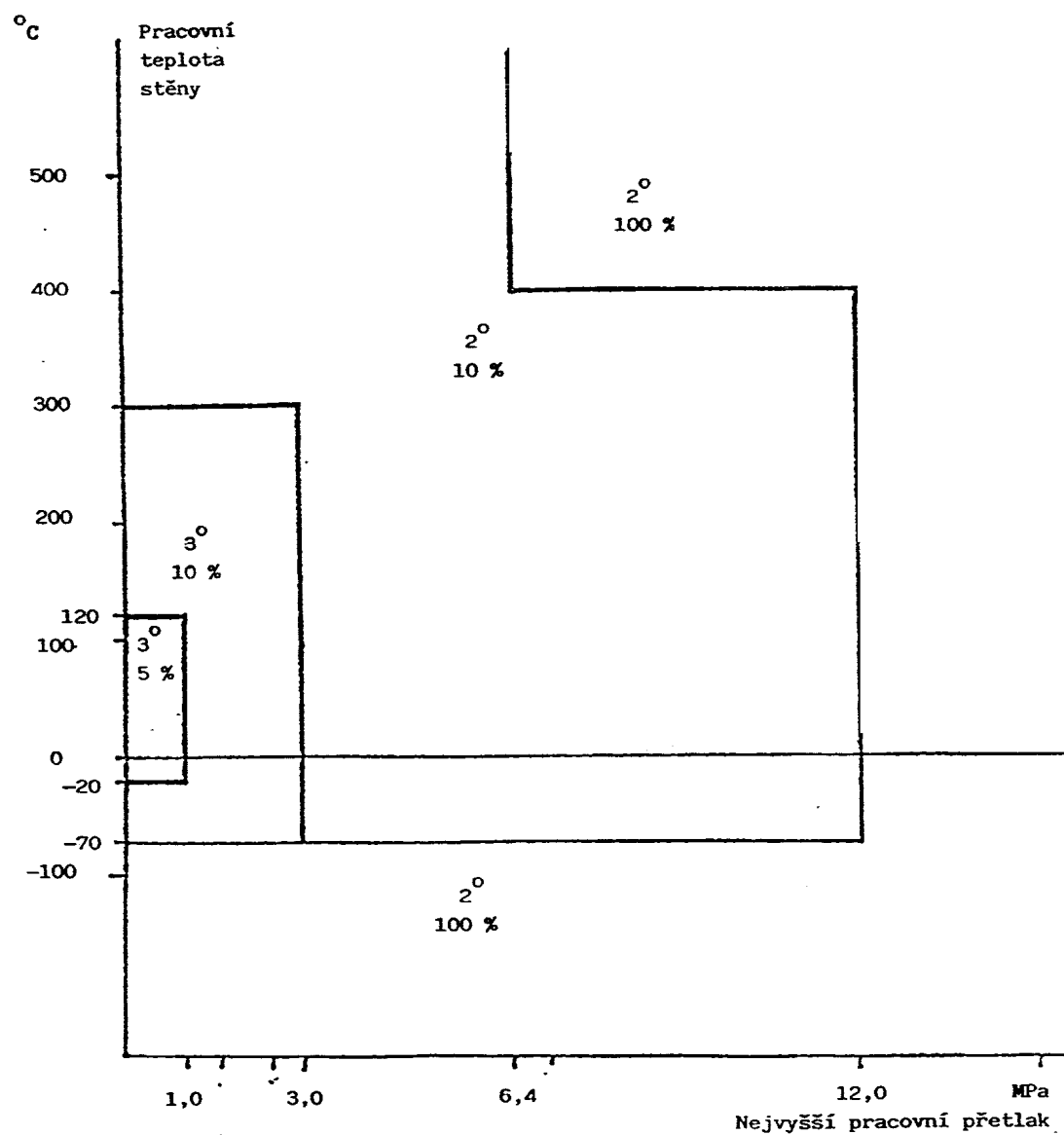




Picture No. 4 - Acceptable weld classification levels and test extents in relation to operation pressure - temperature for pipelines with other operation media.

Applies to operation media of groups III and IV pursuant to N 11 986

Dimension DN > 250





#### 4. Stable pressure containers

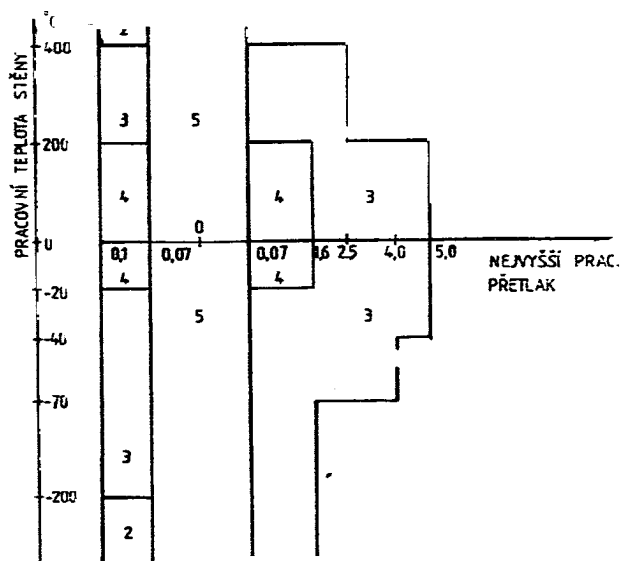
- 4.1 Based on ČSN 69 0010-2.1, ČSN 69 0010-6.3 and ČSN 69 0010-6.4. The standard determines the requirements for container categorization in relation to the character of work media and work parameters.
- 4.2 In order to determine structure, production, inspection, acceptance and delivery requirements, the containers are categorized based on Table No. 1, Container categorization, and Picture No. 5.
- 4.3 Container categorization

Table No. 1 – Container categorization

| Container specification (work conditions)   | Container categorization  |
|---|---|
| For processing and storing explosive and heavily toxic substances (regardless of the wall operation temperature) for an operation overpressure above 0.07 MPa | 1   |
| For processing and storing products not considered in group 1 at an operation overpressure above 0.07 MPa, including vacuum containers.                       | 2, 3, 4<br>Pursuant to Picture No. 5, depending on the given work parameters            |
| Without pressure or with an internal or external overpressure of up to 0.07 MPa.  | 5<br>ČSN 69 0010 does not apply to this category. ČSN 69 0015 applies to this category. |

- 4.3.1 Containers and parameters that fall into the limit lines shall be assigned to the adjoining category with less strict requirements.
- 4.3.2 Category 2, 3 and 4 containers that work with environmentally hazardous substances, not protected by a secondary protection, shall be assigned to the category that is one level higher.

Picture No. 5 - Container categories



#### 4.4. Test extent

- 4.4.1 The weld connection test extent shall be determined based on the given container category, weld connection coefficient and data in the corresponding technical documentation.
- 4.4.2 External examination shall be conducted at accessible locations on both sides of the weld connection.
- 4.4.3 Test extent of butt welds executed by radiation or ultrasound based on given container category and weld connection coefficient shall be conducted in the extent of at least pursuant to Table No. 2 - Extent of tests conducted by radiation or ultrasound.

Table No. 2 - Extent of tests conducted by radiation or ultrasound

| Container category | Length of the inspected weld connections from the total length in % for weld connection coefficient |     | Note   |
|--------------------|---|-----|--|
|                    | A   | B   |  |
| 1                  | 100   | 100 | -  |
| 2                  | 50  | 100 | -  |
|                    | 25  | 50  | Only for containers that work with non-toxic and non-caustic media |
| 3                  | 25  | 50  | -  |
|                    | 10  | 25  | Only for containers that work with non-toxic and non-caustic media |
|                    | 10  | 25  | -  |

|   |                                       |    |  |
|---|---------------------------------------|----|--|
| 4 | 0                                     | 10 | Only for containers that work with non-toxic and non-caustic media |
| 5 | Pursuant to the drawing documentation |    | -  |

4.4.4 Shall occurrence of surface irregularities, such as cracks, be suspected, inspection of the weld flares shall consist of a test using a magnetic powder or capillary method in the extent pursuant to the following table:

Table No. 3 - Extent of weld flare fitting testing

| Container category | Number of inspected flares in % from the total number of flares on the container | Note                                  |
|--------------------|--|---------------------------------------|
| 1                  | 100 %  | The test is conducted layer by layer. |
| 2                  | 100 %  |                                       |
| 3                  | 50 %   |                                       |
| 4                  | 10 %   |                                       |
| 5                  | Pursuant to the drawing documentation.   |                                       |

4.4.5 Shall it not be possible for technological reasons to conduct the stated tests of weld flares, they can be substituted by a demonstrable radiation or ultrasound method.

4.4.6 The weld and its surroundings within at least 25 mm on both sides shall be made free of splashes, ignitions, cinders, slags, corrosion and other dirt that would prevent execution of the given test.

4.4.7 The inspection must include weld connection locations.

4.4.8 Inspections of weld connections of TNS installations by the means of non-destructive methods shall be determined between 10 and 25% or based on the risk factor pursuant to Pictures 1 through 4 of this standard.

#### 4.5 Determining weld connection coefficient

4.5.1 Authorized manufacturers can use the weld connection coefficient stated in column A of Table No. 4 for strength calculations of welded pressure containers or their parts.

4.5.2 The use of coefficients that are higher than those stated in column A, however, pursuant to column B, at the most, shall be subject to approval of the technical supervisory authorities based on special tests.

Table No. 4 - Weld connection coefficient

| Weld type  | Weld connection coefficient |      |
|--|-----------------------------|------|
|  | A                           | B    |
| Butt welds welded from both sides, welded mechanically and arc welded at least from one side, welded under a welding flux or using a melting or non-melting electrode in an inert or active gas.<br><br>Electro slag welds.  | 0,85                        | 1,0  |
| Butt welds welded manually, arc welded and supported after grinding the root. Supported butt welds welded manually, mechanically and arc welded using a melting electrode in an inert or active gas. Butt welds welded from one side, the root layer welded manually using a wolfram electrode in an inert gas or using plasma.  | 0,7                         | 0,95 |
| Butt welds welded on a mat; the mat is closely attached along the entire length of the weld to the basic material and reliably welded to the weld root. Butt welds welded on a mat - copper. Butt welds, arc welded manually from both sides.  | 0,7                         | 0,9  |
| Butt welds, arc welded mechanically from one side, welded under a welding flux on a fluxing mat. Butt welds, mechanically welded from one side using a melting electrode in an inert or active gas. Butt welds, welded from one side while preserving a perfect geometric shape of the welded surfaces (their shape is achieved by chip machining) and perfect edge fitting. | 0,6                         | 0,8  |
| Butt welds, welded from one side.  | 0,5                         | 0,7  |

Table No. 5 - Acceptable classification levels for stable pressure containers

| Weld coefficient | Classification level |
|------------------|----------------------|
| 1                | 1 – 2                |
| 0,9              | 2                    |
| 0,8              | 2                    |
| 0,7              | 3                    |
| 0,5              | 3                    |

## 5. Amendment - list of quoted, related standards and documents

|                                 |  |
|---------------------------------|--|
| ČSN EN 13 480-1                 | Industrial metal pipelines – Part 1: General   |
| ČSN EN 13 480-2                 | Industrial metal pipelines – Part 2: Materials   |
| ČSN EN 13 480-3                 | Industrial metal pipelines – Part 3: Design and calculation  |
| ČSN EN 13 480-4                 | Industrial metal pipelines – Part 4: Production and assembly   |
| ČSN EN 13 480-5                 | Industrial metal pipelines – Part 5: Inspections and testing   |
| ČSN 69 0010-2.1                 | Stable pressure containers - Technical rules - Part 2.1: Container categorization                      |
| ČSN 69 0010-6.3                 | Stable pressure containers - Technical rules - Part 6.3: Weld connection coefficient                   |
| ČSN 69 0010-6.4                 | Stable pressure containers - Technical rules - Production - Part 6.4: Weld connection inspection       |
| ČSN 69 0015                     | Stable containers, category 5 - Technical rules  |
| ČSN EN 13 445                   | Unfired pressure vessels – Part 5: Inspections, testing  |
| ČSN EN ISO 5817                 | Welding – welded joints made of steel, nickel, titanium and their alloys implemented by fusion welding |
| ČSN EN ISO 10 675 - 1           | Non-destructive weld testing - Radiographic testing of weld connections - Acceptability levels         |
| ČSN EN ISO 17 636 - 1           | X-ray and gamma-ray methods that utilize film. Technical testing                                       |
| ČSN EN ISO 17 635               | Nondestructive weld testing. General rules for metal materials.  |
| ČSN EN ISO 17 640               | Nondestructive weld testing – Ultrasound tests. Testing techniques, testing classes and evaluations    |
| ČSN EN ISO 11 666               | Nondestructive weld testing – Ultrasound tests. Acceptability levels                                   |
| S 338<br>nondestructive methods | Input inspections of metal materials and metal products utilizing nondestructive methods               |
| N 11 986                        | Standard for technical documentation, inspections and acceptance of pipeline distribution networks     |