

	Standard	Technology
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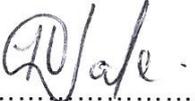
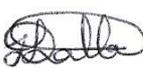
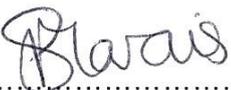
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1. INTRODUCTION

This standard captures the requirements of Eskom's colour coding system for the contents of pipelines and vessels for new premises.

The colour coding system has to be consistent and uniformly applied throughout all Eskom premises including but not limited to power stations, Eskom Real-Estate etc. where pipelines and vessels are utilised.

Colour shades and numbering shall conform to SANS 1091:2012. For plant areas constructed within existing premises the colour coding of the existing premises will be used. For example in the case of the construction of a new plant within an existing power station the existing colour coding system will be used to code the new plant. This standard can however be used for the colour coding of new plant areas within existing premises if the colour coding requirements of the new plant area are not covered by the existing premise standard. It is imperative that only one colour coding scheme is in force within an Eskom premises.

2. SUPPORTING CLAUSES

2.1 SCOPE

The objective of this standard is to identify the contents of pipelines and vessels firstly by group and secondly by identifying the specific fluid in the group. Some groups of fluids are further broken down to identify potential safety risks such as high and low temperature fluids and drinkable and non-drinkable fluids.

2.1.1 Purpose

This standard describes Eskom's requirements for the identification of the contents of pipelines and vessels. It specifies:

- a) The colours and other methods used for the identification of the contents of pipelines and vessels installed above ground or in trenches;
- b) The application of the contents identification system; and
- c) The contents identification materials to be used.

2.1.2 Applicability

This colour coding standard shall apply to all new build premises and to the construction of new plant within existing premises where the existing premises colour coding standard does not cover the new plant area.

Where new plants are designed and added with streams requiring coding that are not covered by this standard or the existing premise standard then the Chemical CoE shall be consulted for assistance.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

- [1] SANS 10140-3:2017, *Identification colour markings – Part 3 : Contents of pipelines*
- [2] SANS 1091:2012, *National colour standards for paint*
- [3] SANS 1186-1:2015, *Symbolic safety signs – Part 1: Standard signs and general requirements*

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[4] SANS 10140-1:2008, *Identification colour marking – Part 1: General*

2.2.2 Informative

[5] SANS 10140-5:2010, *Identification colour marking – Part 5: Coding of containers for carrying lubricants and associated fluids*

[6] 240-106365693 *Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings*

2.3 DEFINITIONS

Definition	Description
Basic Colour	Colour that is used to identify the basic nature of the contents of a pipeline
Clad/Cladding	The external protective metal sheath of the insulation of a pipeline or vessel.
Colour Code Indicator	Colour or a combination of two or three (but not more than three) colours that is used to identify the specific nature of the contents of a pipeline. These colours are applied as an addition to the basic colour.
Compatible Material	Material that is capable of performing the required function(s) under the specific conditions of service.
Descriptive Code Indicator	Description given in the form of a chemical formula, or symbol, or words, or pictograms and that is used in conjunction with the colour coding system as further aid in the identification of the specific contents of a pipeline, including temperature, pressure and direction of flow.
Hot	Hot means that the temperature of the contents exceeds 60°C.
Lagged	Indicates an insulated pipe or vessel that has no external protective sheath.
Outside Diameter	The outside diameter means the outside diameter of a pipe/vessel or where lagged/clad, the diameter over the lagging/cladding.
Rectangular area	An expression used for the display area of the contents identification on a pipeline or vessel.

2.4 DISCLOSURE CLASSIFICATION

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.5 ABBREVIATIONS

Abbreviation	Description
API	American Petroleum Industry
OD	Outside diameter
O&M	Operating and Maintenance
SANS	South Africa National Standards

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2.6 ROLES AND RESPONSIBILITIES

The operating and maintenance (O&M) engineer for the specific plant area shall be responsible to ensure the correct colour coding is applied for their system.

The Safety and Risk Manager shall ensure that any personnel working on the plant are trained on the colour coding utilised on the premises. Induction training shall include the colour coding system employed on that site.

The Safety and Risk Manager shall be responsible for updating the colour charts on display as and when required.

2.7 PROCESS FOR MONITORING

The Process Water Production Care Group, under the Water Sciences and Technologies Study Committee, shall be responsible to conduct reviews at the various sites to ensure compliance.

2.8 RELATED/SUPPORTING DOCUMENTS

N/A

3. REQUIREMENTS

3.1 CONTENTS IDENTIFICATION

3.1.1 General

The contents of pipelines and vessels shall be identified by a basic colour that indicates the group of fluids in accordance with Table 1, Table 2, Table 3 and Table 4 of Appendix A.

The specific content is defined by the colour code indicators as well as the warning signs and descriptive indicators in accordance with Appendix C and Appendix D.

The colour references and codes shall be in accordance with SANS 1091 and is summarized in Appendix B.

3.1.2 Colour Code Indicators

- a) First colour indicator
 - i. In the case of a pipe/vessel painted over its entire length/surface with the basic colour, the first colour code indicator is in the form of a band ON the basic colour, see Figure 7
 - ii. Where the pipe/vessel is not painted in the basic colour or is clad, the first colour code indicator is in the form of a band applied BETWEEN two basic colour bands, see Figure 8.
- b) Second colour indicator
 - i. Where the second colour code indicator is specified it is repeated in bands on each side of the first colour code indicator band, see Figure 9 and Figure 10.

3.1.3 Identification Materials, Width of Bands and arrangement

- a) Materials
 - i. Paint (see Appendix B Table 5)
 - ii. Adhesive bands (see 3.1.4).
 - iii. Labels.

Adhesive bands shall not be applied to surface with temperatures above 115 °C.

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b) Width of bands

The height of bands is according to the legend height as per Table 6.

The width of band is equal to 30% of the pipe OD with a minimum width of 25mm and a maximum width of 150mm.

c) Arrangement of bands

The bands are applied adjacent to each other; see Table 1, Table 2, Table 3 and Table 4 of Appendix A for the band colours.

3.1.4 Adhesive Bands

Ensure that paint adhesive bands used to apply identification colours are of compatible material and of the appropriate colour. Adhesive bands shall not be applied to surfaces with operating temperatures above 115°C.

3.1.5 Direction of Flow Arrow

The direction of flow arrows are of white colour with dimensions in accordance to Table 6 in Appendix C and Figure 19.

3.1.6 Descriptive Code Indicator

Position of the symbols and materials are in accordance with Table 6 and Figure 3.

The descriptive code indicator shall describe the contents of a pipeline by the name in full, or by an abbreviation of the name and be aligned to the Power Station's existing naming philosophy (see SANS 1186-1:2015) Characters shall be of the type given in SANS 10140-1:2008 and the size according to the legend height in Table 6 of Appendix C.

3.1.7 Legend Size

The height of the letters used for identification of the specific contents of the pipeline or vessel (e.g. hydrogen, fuel oil, sewage) is superimposed on a 'rectangular area' in the basic colour in accordance with Appendix C, Table 6, Figure 1, Figure 12, Figure 13, Figure 14, Figure 15, Figure 16 and Figure 17.

3.1.8 Plate Labels

For pipelines smaller than 35 mm OD the descriptive indicators are placed on labels or plates secured to the pipeline as Figure 1.

3.1.9 Hazardous Contents

If contents of a pipeline or vessel are dangerous, for example; toxic, corrosive, radioactive, flammable or under high pressure, etc. the addition of appropriate special cautionary identification bands (golden yellow – B49) with size given as in 3.1.3 and when relevant the attachment of a symbolic safety sign (see SANS 10140-1:2008 and SANS 1186-1:2015) to the pipeline is required, see Figure 20.

For all pipeline and vessels the following applies under these conditions:

- a. Operate at pressure in excess of 4 MPa and convey steam or hazardous substances;
- b. Operate at a temperature above 250 °C

The pressure must be displayed only when condition a. exists, the temperature must be displayed only when condition b. exists, and the pressure and temperature must be displayed when both a. and b. exist. The pressure and temperature must be displayed on the pipeline or vessel as per Figure 16 and section 3.1.6.

3.1.10 Low Level Pipe Hazards

Where a pipe crosses a pedestrian walkway such that it creates an obstruction, this pipe is marked as per the method shown in Figure 18.

3.2 APPLICATION CATEGORIES FOR IDENTIFICATION OF PIPELINE AND VESSEL CONTENTS

Details of the application of contents identification to pipelines and vessels are as follows:

3.2.1 Small Diameter Pipes

Pipelines of 35 mm OD and below are painted in the basic colour over their full length. Colour code indicator bands are superimposed and spaced at 10 m intervals.

3.2.2 Large Diameter Pipes

In cases of long exposed sections of large diameter pipes, due consideration shall be given to the costs incurred with regard to the use of a basic colour over the full length. The spacing of the identification information (bands and descriptive) may be more than 10 m. The length between bands in this case should be approved by the relevant responsible engineer for the system and the length should conform to the basic principles of this specification as described in section 3.2.3.

3.2.3 Short Pipe Runs

Short pipes, i.e. less than 600 mm long are painted the basic colour over their full lengths in accordance with Figure 5.

3.2.4 Long Pipe Runs

Identification bands are space at intervals of 10 m nominally along the length of the pipe and adjacent to valves, wall and floor penetrations, bends and tees in accordance with Figure 6, Figure 11, Figure 12 and Figure 13.

3.2.5 Fire Fighting Services

Unburied internal and external pipelines used for firefighting shall be entirely painted in their basic colour in accordance with the colour depicted in Table 1 irrespective of the materials of the construction of the pipeline. The paint used shall also ensure that the required corrosion protection for the pipeline is met.

Banding for Foam Firefighting piping will be provided in accordance with Figure 5. In certain cases, banding shall be allowed on galvanized firefighting piping, subject to approval by the LPS CoE.

3.2.6 Semi-Concealed Pipework

In cases of hydro power stations or other installations where most pipework is carried in covered trenches, the pipelines are painted the basic colour over their entire length subject to clause 3.2.2. Colour code indicator bands if specified are only applied at access positions such as manholes.

3.2.7 Stainless Steel and Galvanizing

Stainless steel and galvanizing pipework is not to be painted, except for identification bands, unless required for additional corrosion protection or in the case of firefighting services (as per 3.2.5).

3.2.8 Corrosion Resistant Materials

Corrosion resistant materials such as plastics are not painted except for identification bands unless required for protection from ultraviolet radiation. In such cases the basic colour is applied.

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3.2.9 Insulated Pipes and Vessels for Steam and Chemicals

- a) Insulated pipes and vessels protected by cladding do not require painting except for colour code indicator bands see Table 4.
- b) Insulated pipes and vessels without cladding are painted along their full length in the basic colour with colour code indicator bands.

3.2.10 Multi-Pipeline Runs

Colour identification and descriptive identification are positioned on multi-pipeline runs such that the identification of all pipes in the run is clearly visible from an observation position, see Figure 4.

3.2.11 Aesthetics

Pipelines and vessels located in areas of aesthetic importance are painted in a suitable colour in accordance with the architect's colour scheme provided that contents identification is applied at suitable places and intervals.

3.2.12 Aluminium Colour

Where the contents of a pipeline or vessel require protection from heat or cold of its surroundings, consideration is given to the use of an aluminium colour subject to the application and positioning of identification bands.

3.2.13 Vessels

In special cases where vessels are not required to be painted entirely in their basic colour (e.g. in the case where the tank is too large and factory painted with a colour that cannot be influenced, manufactured of a material that cannot be painted, when the tank is cladded, etc.), a protective paint scheme, (including aluminium colour) can be used, provided that due consideration is given to the costs incurred. Where any colour, other than the basic colour, is used to paint the vessel, the basic colour is represented as bands in accordance with Appendix C Figure 2 and Figure 3.

All tanks shall have their identification name or number painted on in two positions, one that is visible from the fire-service access route and the other opposite it, as follows:

- Numerals and letters shall be in colours that contrast with that of the tank shell; and
- Characters shall be of such size as to be clearly visible and identifiable, of minimum height 290mm and of minimum width 25 mm.

A description of the contents of the tank shall be prominently displayed on the tank, for example by using a label which complies with the requirements of SANS 10232-3.

3.3 KEY SAFETY AND TRAINING CONSIDERATIONS IN THE APPLICATION OF THE COLOUR CODING STANDARD

- Employees working across Eskom premises must note that the colour coding system may differ from premise to premise.
- It is imperative that those who carry out work involving, or in the vicinity of, a group of pipelines be trained to understand the colour coding system from induction training to ongoing training and toolbox discussions.
- Identifying and assisting any colour-blind workers are also important facets of this training.
- Premises shall have on display a pipeline content colour identification chart or board relevant to their installation. This can be used as a visual aid in training, and also as a daily reminder of the colour representing the contents of pipelines.

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- When job cards, work permits and the like in respect of pipework are issued the mention of the pipeline content and its specific colour code would assist those who are to carry out the work to do so in a safe manner.
- Compliance to the Standard for the External Corrosion Protection of Plant, Equipment and Associated Piping with Coatings [6] shall be enforced during the application of the paint.

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5. REVISIONS

Date	Rev.	Compiler	Remarks
August 1995	0	B. Cooper	Original Eskom Specification for the Identification of the contents of Pipelines and Vessels (Specification Number: ESKSCAAC6)
May 2015	0.1	PT du Toit	Draft Specification for the Identification of the contents of pipelines and vessels for New Build Project (Specification Number: 474-296)
February 2019	0.1b	J. Varden	Draft Document for Comments Review.

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Date	Rev.	Compiler	Remarks
			<ul style="list-style-type: none">• Applicability of the document changed to all Eskom sites• Inclusion of FGD plants• Explanation of how non-compliance to SANS 10140-3 will be addressed at all Eskom sites
March 2019	0.2	J. Varden	Final Draft Document after Comments Review Process
July 2019	0.3	J. Varden	Updated final Draft after additional Comments
July 2019	0.4	J. Varden	Additional Updated to be done
August 2019	0.5	J. Varden	Final Draft after updates Completed
August 2019	1	J. Varden	Final Document for Authorisation and Publication

6. DEVELOPMENT TEAM

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7. ACKNOWLEDGEMENTS

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APPENDIX A:

Identification colours of liquids and gases in Eskom excluding fluids for medical use and nuclear power products

Table 1 Non-Clad Pipes and Vessels

Contents	Colour code indicators		
	Basic colour	Primary Colour	Secondary Colour
Air			
Service/plant air	Arctic blue	-	-
Electrical service air	Arctic blue	Maroon	-
Instrument/control air	Arctic blue	Salmon Pink	-
Atmospheric relief	Arctic blue	Crimson	-
Vacuum	Arctic blue	Primrose	-
Acids and Alkalis			
Acids	Jacaranda	-	-
Alkalis	Dove grey	-	-
Ash			
Ash slurry	Light Grey	Golden yellow	-
Pneumatic conveying	Light Grey	-	-
Pneumatic conveying pressure vessels	Light Grey	-	-
Chemicals (<i>Applicable to Medupi Power Station only</i>)			
Tolytriazole	Jacaranda	Black	-
Trisodium phosphate	Dove grey	Black	-
Sodium Hypochlorite	Dove grey	Canary Yellow	White
Sodium Meta Bisulphite/ Sodium bisulfite	Jacaranda	Black	White
Ancillary Chemicals and/or solutions (<i>Applicable to Medupi Power Station only</i>)			
Salt/brine solution	White	Salmon Pink	-
Chlorine liquid or gas	White	Canary Yellow	-
Flocculent	White	Grass green	
Coagulant	White	Grass green	Golden brown
Biocide	White	Black	-
Anti-scalant	White	Crimson	-
Soda ash	White	Golden brown	-

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Lime	White	Arctic blue	-
Flue Gas Desulphurisation Systems*			
Gypsum Slurry	Greenish-grey-light brown		
Limestone	Sienna sky		
*All other process streams must follow the colour coding adopted for the pipeline from the source			

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Table 2 Non-Clad Pipes and Vessels (continuous)

Contents	Colour code indicators		
	Basic colour	Primary Colour	Secondary Colour
Gas			
Acetylene	Light stone	Maroon	-
Argon	Light stone	Peacock blue	-
Carbon dioxide	Light stone	Lt brunswick green	Light grey
Chlorine	Light stone	Canary yellow	-
Freon R11, R12, R22	Light stone	Strong blue	-
Helium	Light stone	Middle brown	-
Hydrogen	Light stone	Poppy red	-
Nitrous oxide	Light stone	Ultramarine	-
Nitrous oxide & oxygen mixture	Light stone	White	Ultramarine
Nitrogen	Light stone	Light grey	Black
Oxygen	Light stone	White	-
Butane – propane	Light stone	LPG (superimposed)	-
Sulphur hexafluoride	Light stone	SF6 (superimposed)	-
Blast furnace	Light stone	Crimson	-
Methane	Light stone	Black	Poppy Red
Hydrocarbons			
Diesel fuel	Aluminium /Silver Golden Brown	Middle buff White	-
Oils			
Hydraulic power	Golden brown	Salmon pink	-
Lubricating oil	Golden brown	Verdigris green	-
Transformer oil	Golden brown	Crimson	-
Seal oil	Golden brown	Canary yellow	-
Fuel oil	Golden brown	Black	-
Turbine oil	Golden brown	Light grey	-
Industrial gear oil	Golden brown	Maize	-
Air compressor oil	Golden brown	Jacaranda	-
Open gear oil	Golden brown	Dark grey	-
Refrigerants and air conditioning	White	-	-

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Table 3 Non-Clad Pipes and Vessels (concludes)

Contents	Colour code indicators		
	Basic colour	Primary Colour	Secondary Colour
Fire resistant fluids	Golden brown	Dark violet	-
Drinkable water			
Drinkable water – cold	Brilliant green	Cornflower	-
Drinkable water – hot	Brilliant green	Crimson	Cornflower
Non-drinkable water			
Condensate < 60 °C	Strong blue	-	-
Softened raw water	Strong blue	-	-
Demineralized water	Strong blue	White	-
Chilled water	Strong blue	Cornflower	-
Hydraulic power	Strong blue	Salmon pink	-
Sealing water	Strong blue	Verdigris green	-
Main Cooling water	Grass green		-
Auxiliary cooling – Open circuit	Grass green	Light stone	-
Auxiliary cooling – Closed circuit	Grass green	Canary yellow	-
Raw water	Grass green	Salmon pink	-
Filtered Water	Grass green	White	-
RO permeate	Strong blue		-
Firefighting	Signal red	-	-
Firefighting (Foam line)	Signal red	Biscuit	-
Drains			
Sewage	Black	-	-
Non-recoverable waters	Black	-	-
Storm water/Clean drains	Black	Strong blue	-
Storm water dirty/Dirty drains	Black	Crimson	
Recoverable waters	As pipework for recovered process	-	-
Vacuum Cleaning			
Insitu vacuum cleaning systems	Arctic blue	Primrose	-

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Table 4 Clad Pipes and Vessels

Contents	Colour code indicators		
	Basic colour	Primary Colour	Secondary Colour
Air > 50°C			
Aeration air	Cladding	Arctic blue	Golden yellow
Oxidation Air	Cladding	Signal grey	
Steam			
Main steam	Cladding	Pastel grey	-
Hot reheat	Cladding	Crimson	-
Cold reheat	Cladding	Crimson	Maroon
Auxiliary steam	Cladding	Canary yellow	-
HP Bled	Cladding	Light brunswick green	-
LP Bled	Cladding	Light brunswick green	Peacock blue
Saturated steam	Cladding	Verdigris green	-
Gland steam	Cladding	Signal red	-
Water > 60 °C			
Condensate	Cladding	Crimson	Strong blue
Boiler feed	Cladding	Crimson	White
Distillate	Cladding	Crimson	White
Chemical			
Acids	Cladding	Jacaranda	-
Alkalis	Cladding	Dove grey	-
Drains			
Non-recoverable waters	Cladding	Black	-
Recoverable waters	Cladding	As pipework	-

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APPENDIX B

Table 5 Colour References and Code Numbers to SANS 1091:2004

Colour	Number
Arctic blue	F28
Biscuit	B64
Brilliant green	H10
Canary yellow	C61
Crimson	A03
Cornflower	F29
Dark grey	G13
Dark violet	F06
Dove grey	G22
Golden brown	B13
Golden yellow	B49
Grass green	H14/D14
Jacaranda	F18
Light brunswick green	H07
Light grey	G29
Middle Buff	B33
Light stone	C37
Maize	B32
Maroon	A01
Middle brown	B07
Peacock blue	F08
Poppy red	A14
Primrose	C67
Salmon pink	A40
Signal red	A11
Strong blue	F11
Ultramarine	F09
Verdigres green	E22
White	No number
Black	No number
Aluminium/White	No number
Pastel Grey	G54

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The colours are chosen from SANS 1091:2004, the SANS colour system is based on the National Colour System (NCS) which is an international standard of determining colour mixes. The NCS is generally used for the mixing of paint. When other materials than paint is used like, stickers, the colours from the manufacturers supply may not be based on the NCS or SANS colour mechanism. This means that no link can be drawn from the manufacturer colour to the SANS colour. In cases like this the closest colour matching the SANS specified colour may be used. The best way of matching colours are to use samples from both the manufacturer and SANS colours and choosing the closest match possible. In cases like these the match must be approved by the relevant Eskom Engineer.

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APPENDIX C

Table 6 Dimension and arrangement of Descriptive Identification Legends for Pipelines and Vessels

Outside diameter (mm)	Legend height (mm)	Chemical hazard legend height (mm)	Direction of flow arrow
			Length (mm)
Up to 50	25	20	75
51 to 100	25	25	100
101 to 150	50	50	150
151 to 225	50	100	200
226 to 300	100	150	300
301 to 600	100	150	300
601 and Above	150	150	300

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Rectangular descriptive label fixed securely to the pipeline and painted in the basic colour.



Figure 1: Plate Labels for Small Diameter Pipelines

Descriptive identification including symbols and signs. Colour identification in accordance with Table 1. W is the legend height in accordance with Table 6. The length is determined by description and symbols.

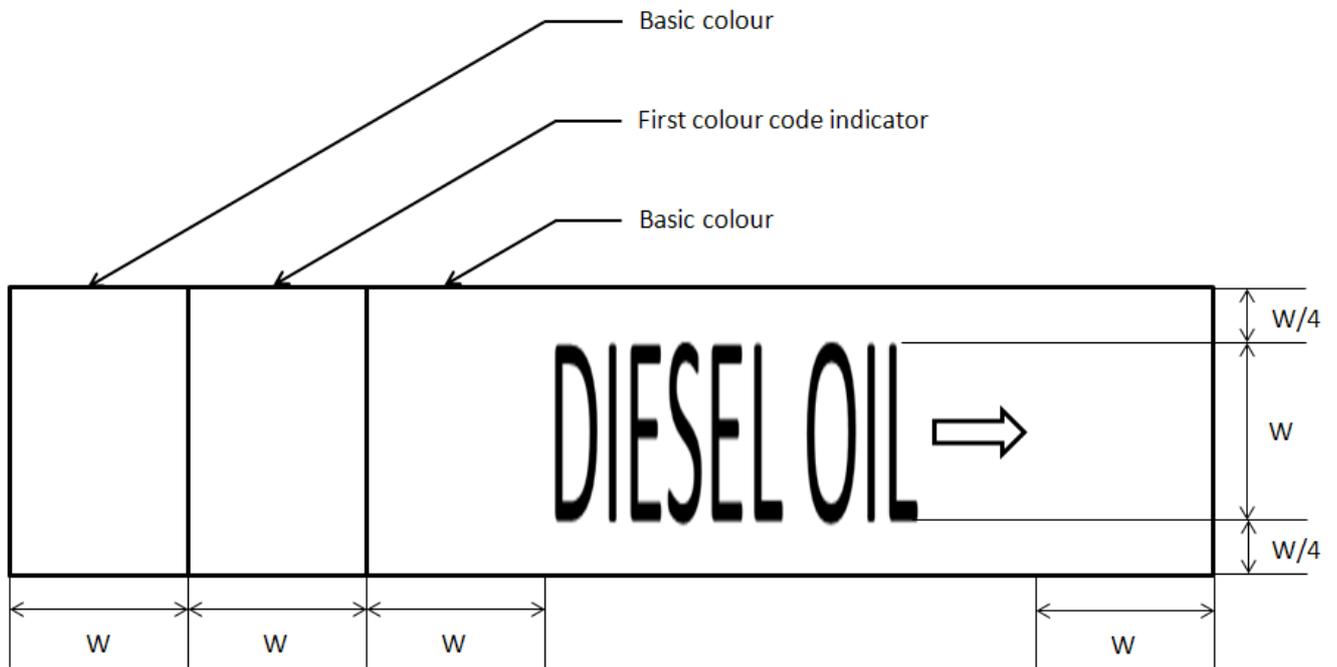


Figure 2: Example of Labels and Rectangular Areas

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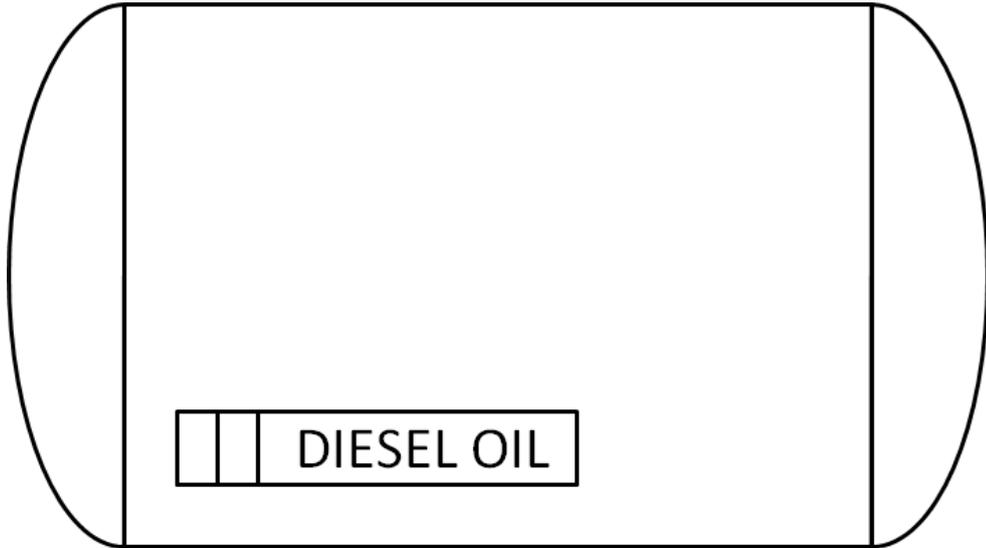


Figure 3: Application of Contents Identification to Vessels

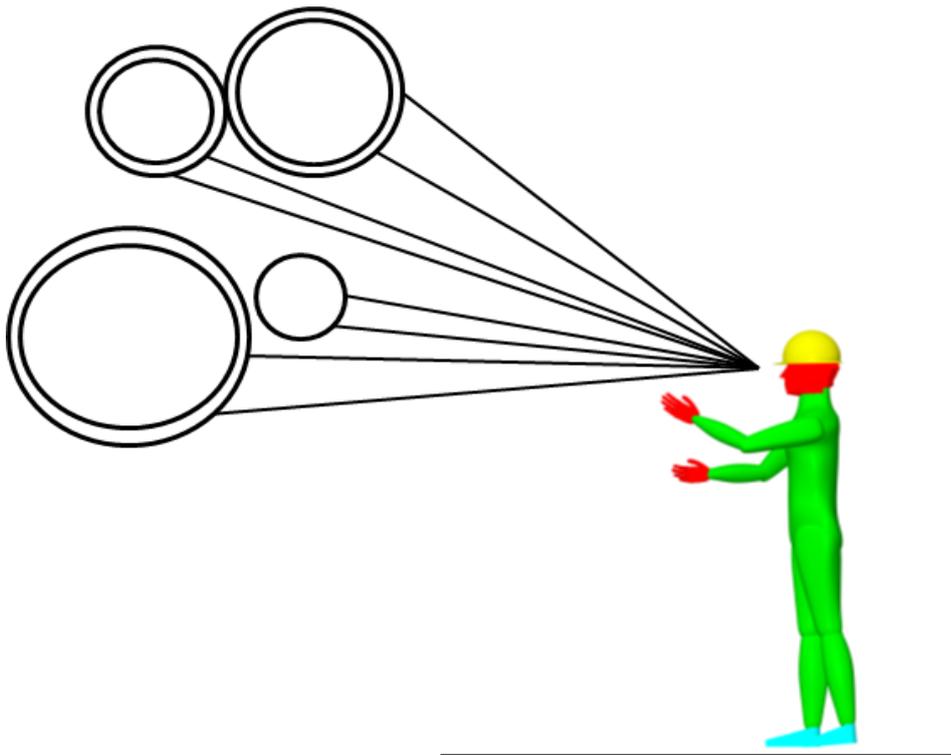


Figure 4: Visibility of Identification on Multi-Pipeline Runs

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APPENDIX D

Application of the contents identification to pipelines and vessels. Drawings not to scale and dimension "W" are as per legend height Table 6.

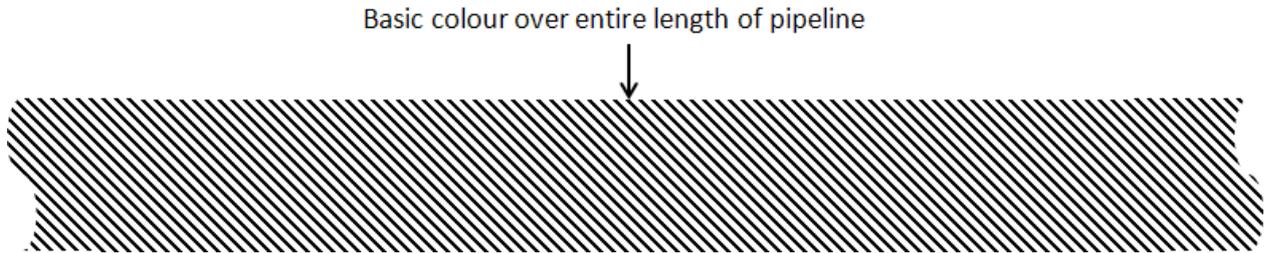


Figure 5: Basic Colour over Entire Surface

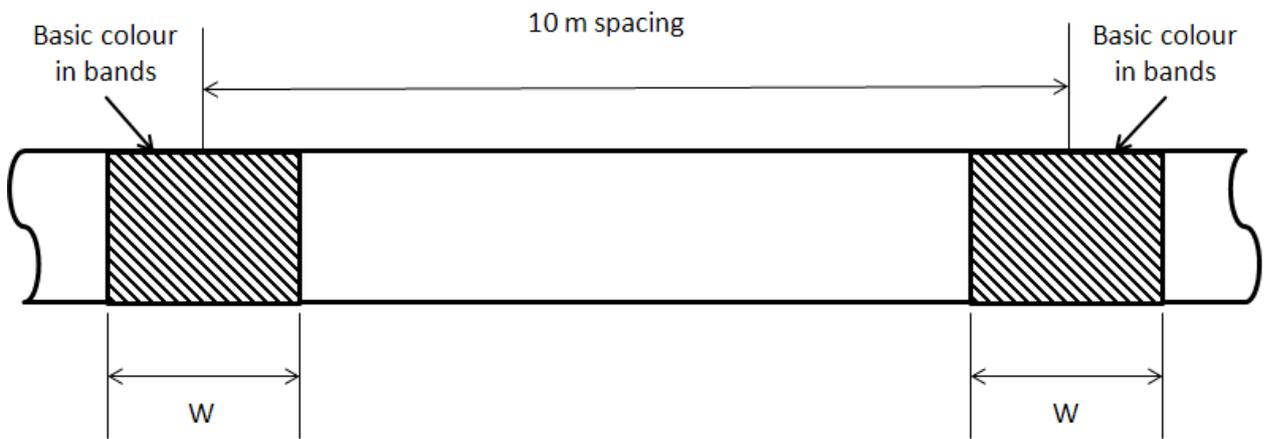


Figure 6: Identification at Intervals of 10m on Pipe of Non-Basic Colour and Unpainted Pipe

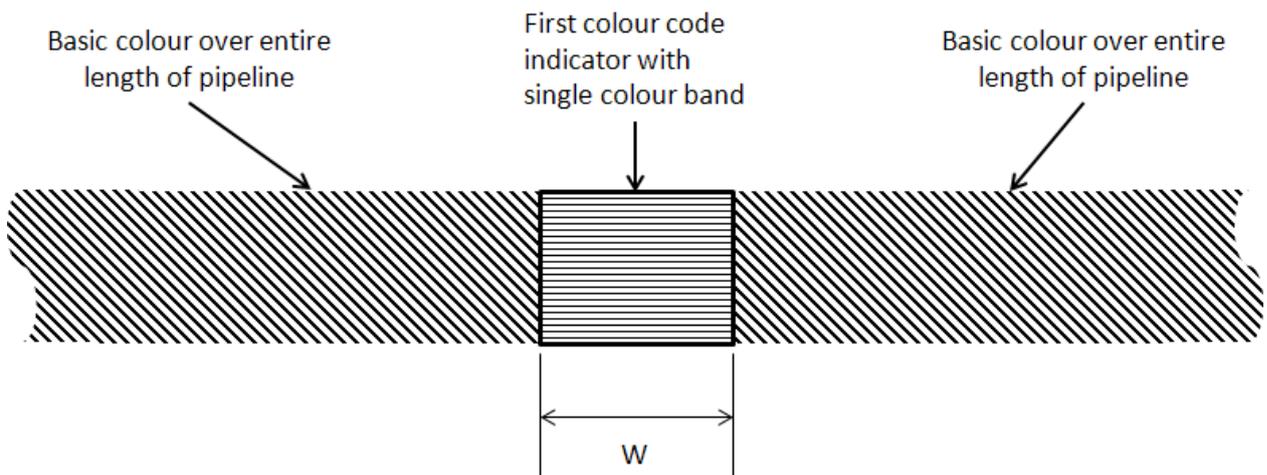


Figure 7: First Colour Code Indicator on Basic Colour

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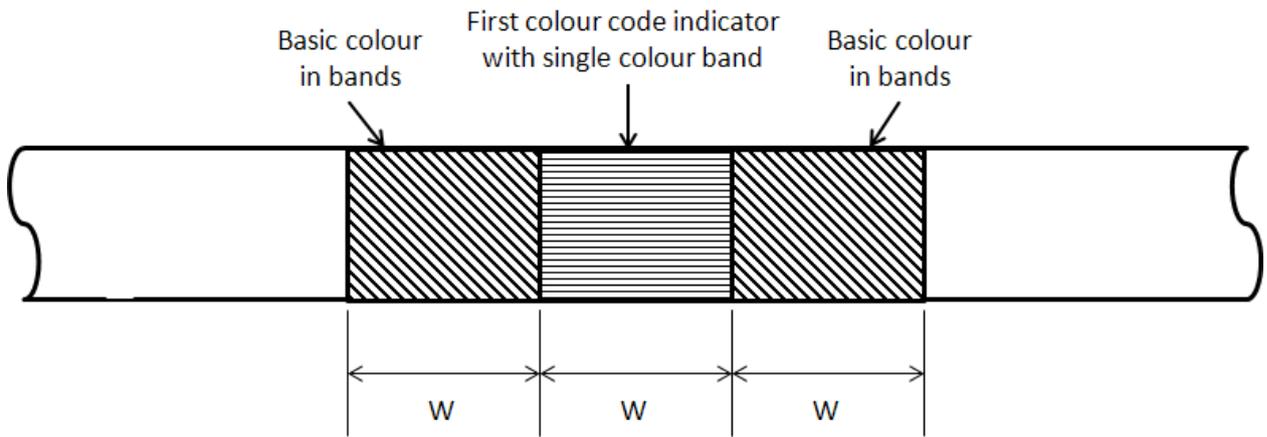


Figure 8: First Colour Code Indicator on Pipe of Non-Basic Colour and Unpainted Pipe

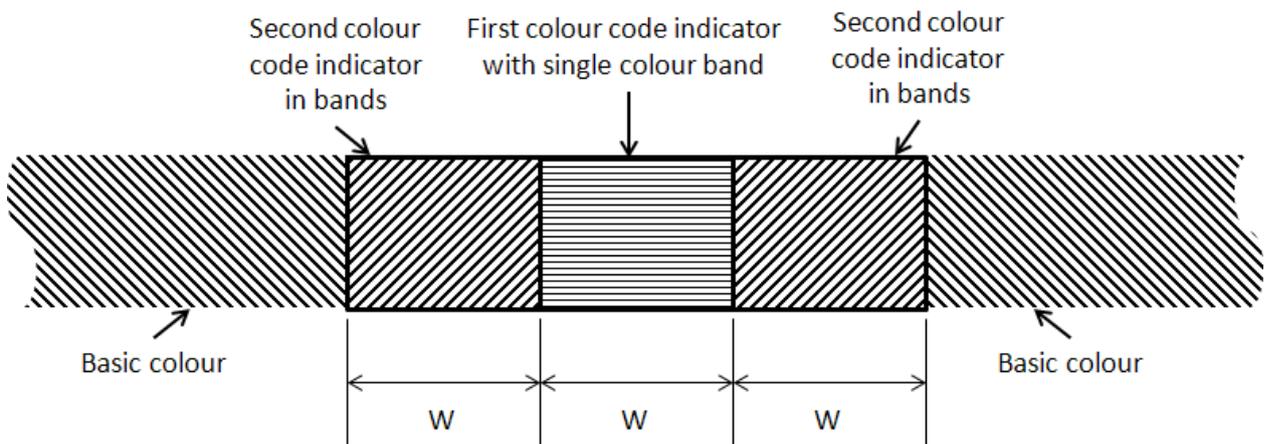


Figure 9: Second Colour Code Indicator on Pipe of Basic Colour

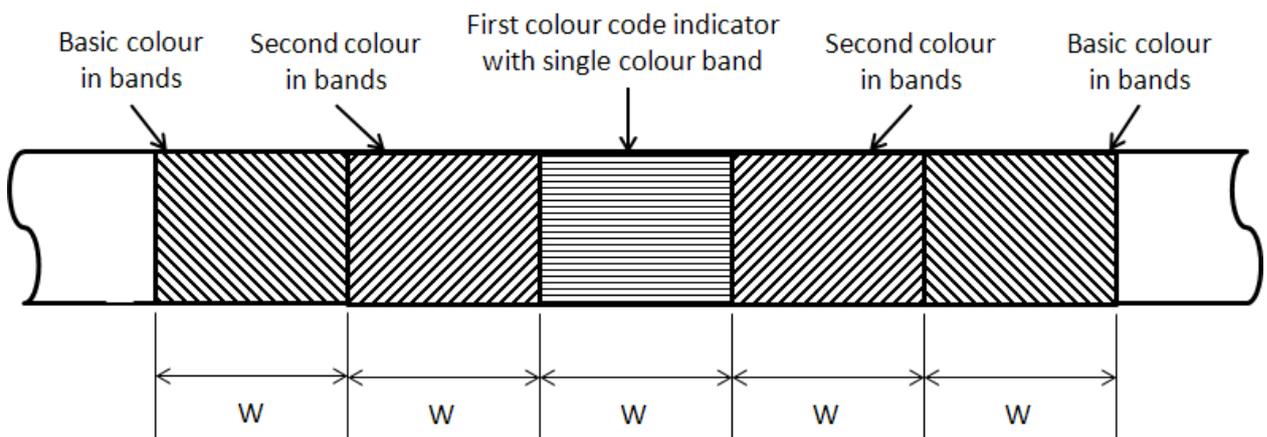


Figure 10: Second Colour Code Indicator on Pipe of Non-Basic Colour and Unpainted Pipe

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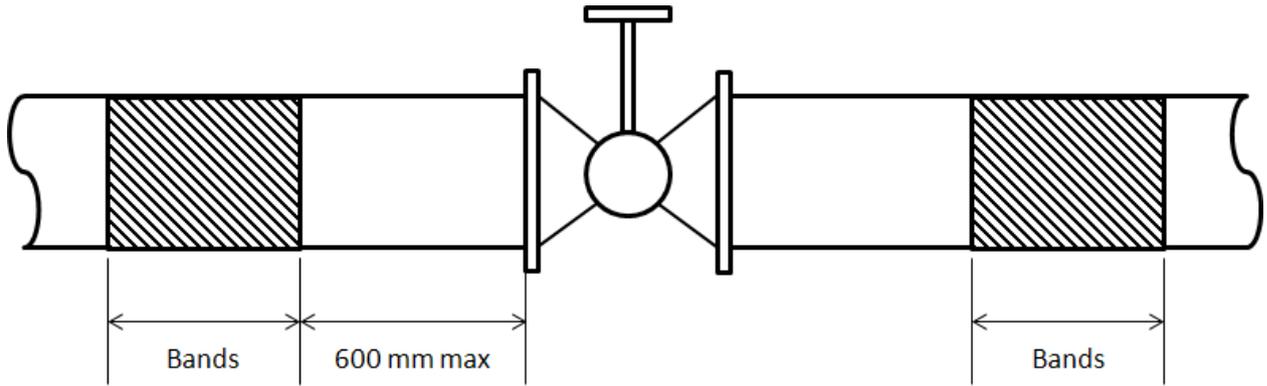


Figure 11: Colour Identification around in-line Equipment

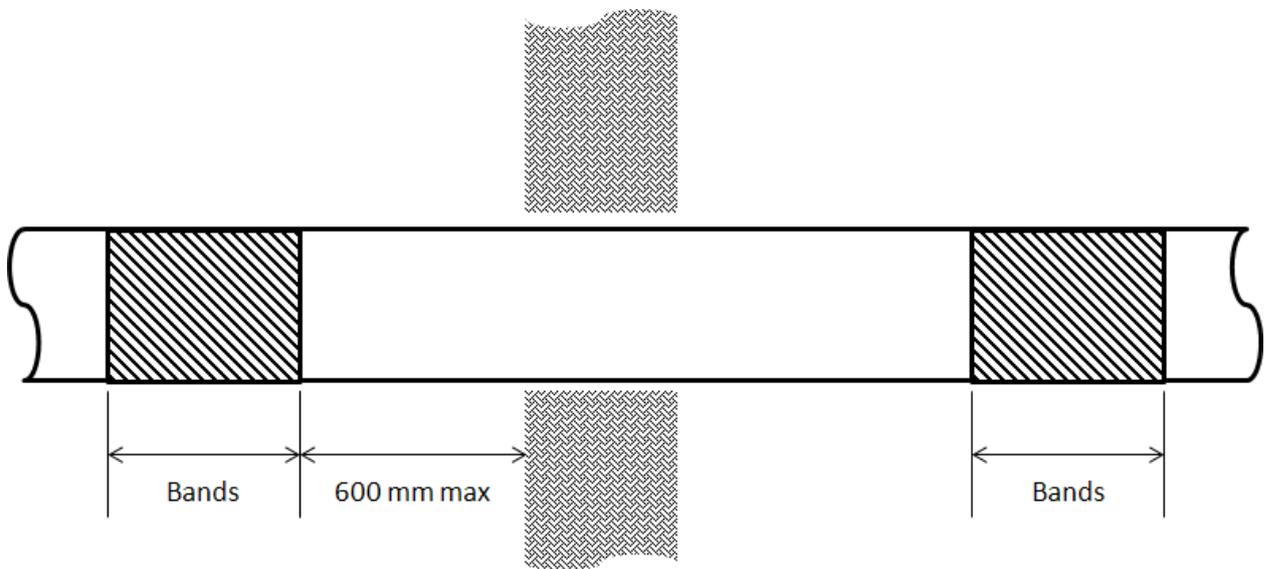


Figure 12: Colour Identification at Bulkheads, Wall Penetrations and Floors

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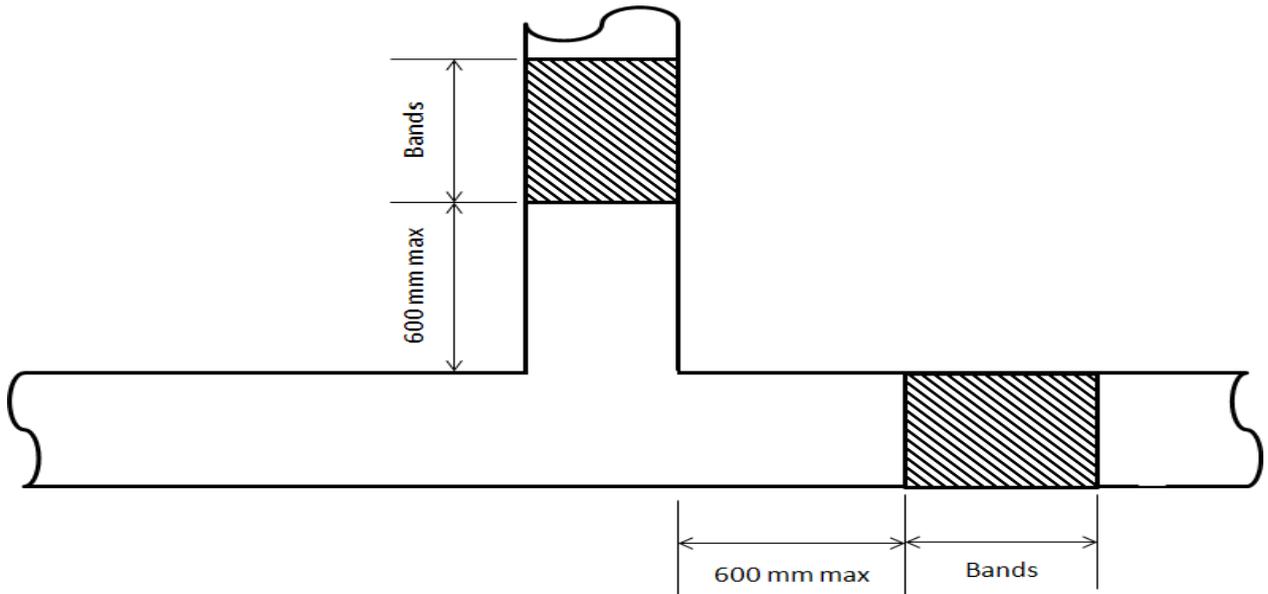


Figure 13: Colour Identification at Piping Junctions or Connections

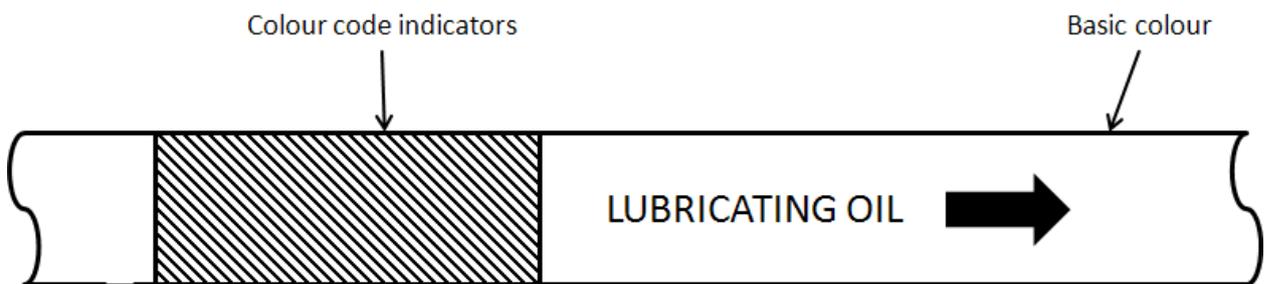


Figure 14: Identification of content Example 1

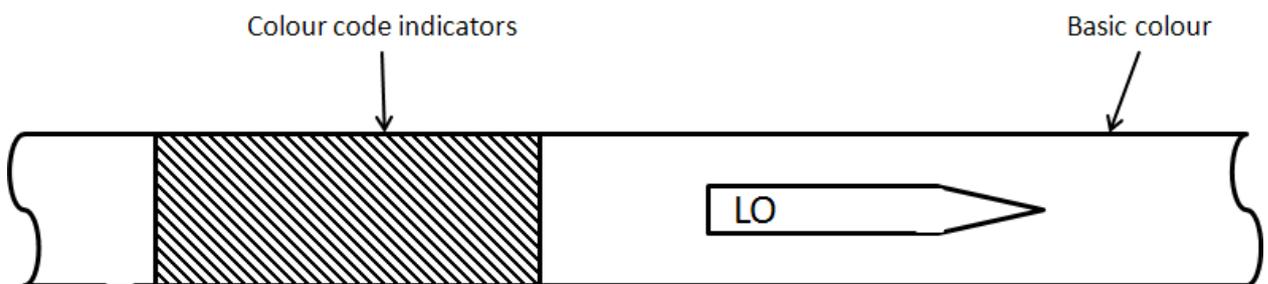


Figure 15: Identification of content Example 2

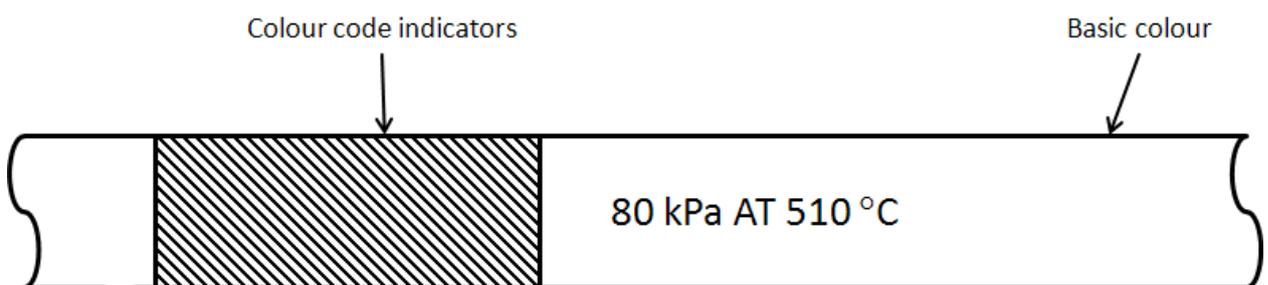


Figure 16: Identification of content Example 3

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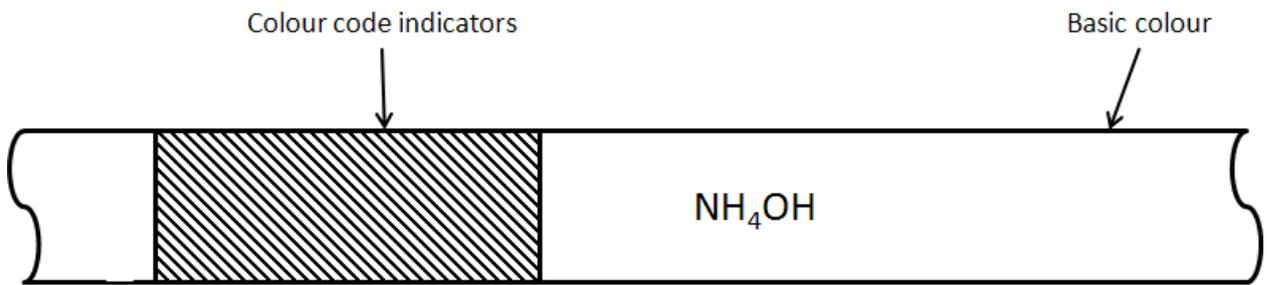


Figure 17: Identification of content Example 4



Figure 18: Golden Yellow Bands with Superimposed Black Diagonal Strips

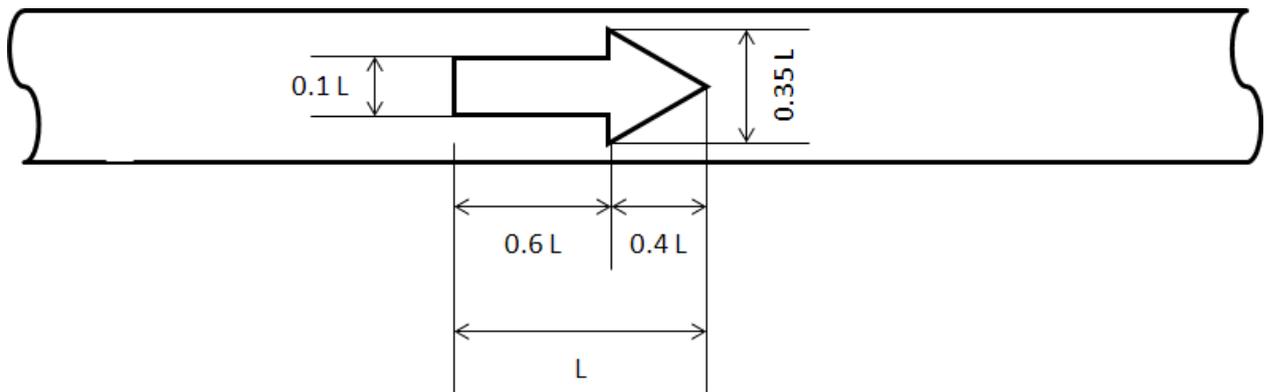


Figure 19: Direction of Flow Symbol. Refer to Table 6 for L



Figure 20: Ionizing Radiation Hazard Symbol with Golden Yellow Band

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