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1. GENERAL

1.1. SCOPE
This document covers the requirements for glass bottles for use by or under supervision of Heineken Supply Chain B.V.
This standard applies for:
1. All glass bottles for Heineken consolidated companies as per financial statement.
2. Glass bottles for corporate brands and other Heineken owned brands for Heineken unconsolidated companies as per financial statement and via license operations.

The scope of this standard is limited to packaging materials ordered, purchased or produced as from the publication date of this standard.

1.2. OWNERSHIP
"This document including all information, drawings, designs or plans contained therein, is the property of Heineken Supply Chain B.V., The Netherlands and all intellectual property therein, including all proprietary and confidential information, know-how, designs and/or data, remains vested in and is owned by Heineken Supply Chain B.V., The Netherlands, further referred to as Heineken GSC.

This document may also contain information, drawings, designs or plans owned by third parties and such information may be proprietary and confidential and protected by intellectual property rights of such third parties.

This document may not be used, copied, and/or reproduced in whole or in part for any purpose, unless such usage, copying and/or reproduction has been specifically permitted in writing by Heineken Supply Chain B.V., The Netherlands."

1.3. REVISION HISTORY
This standard is amended.
It replaces per November 2009 version 02 of December 2008.

1.4. CLARIFICATION AND ADDITIONAL INFORMATION
In case clarification or additional information is needed concerning any subject of this standard or other related documents, please contact Heineken GSC in Zoeterwoude, The Netherlands.

1.5. DEVIATION FROM THIS STANDARD
Application of this standard is mandatory. Regional and/or Local Management has the obligation to put forth any deviation for approval by Heineken GSC Policies through the Regional Supply Chain Manager.

1.6. HARD COPIES
If this standard is printed, the soft copy will be the most up to date, therefore do check with your Heineken representative.

1.7. QUALITY REQUIREMENTS CORPORATE BRANDS VS LOCAL BRANDS
Brand governance may differ between corporate brands and local brands and therefore may result in a differentiation in requirements for packaging materials. Deviation in requirements from this standard is only allowed for local brands for parameters not being integrity or legal related. The parameters which may deviate are indicated as such in the section Requirements.

Deviation of other parameters is subjected to the procedure as described under Deviation from this standard.

1.8. DOCUMENTATION
This document is part of a series of three documents which as a set only describes for glass bottles all requirements, procedural aspects and technical data. See figure below.

The related documents are:
1. Packaging Material Quality Manual (ref. 04.00.10.000)
2. Packaging Material Technical Standards Glass Bottle (individual standards per bottle).

Where in this document reference is made to specific sections of either of these documents, this is indicated by the text ‘Consult paragraph … in ….’

1.9. GOVERNING STANDARDS
Any standards concerning glass bottles imposed by the local governing authority will become part of this standard wherever applicable.
In case of discrepancies between these standards, the more stringent of either the Heineken GSC or the local governing authority standards holds. The supplier shall comply with local governing requirements, taking into account the country of production. Regulations applicable in the country of use shall be provided by the Heineken affiliate.

1.10. SUPPLIER RESPONSIBILITY
Nothing in this standard should be construed (interpreted) as relieving the packaging material supplier of any...
responsibility with respect to legislative standards and the quality of the relevant packaging materials. The Supplier shall therefore be liable for conformance to the Heineken standards and for any quality issues or consumer complaints associated with failure due to packaging defects. Moreover, the intake of materials by the Heineken affiliate does not discharge the supplier’s liability should quality issues, attributable to the packaging, arise during the life cycle of the packaging, and especially during the packing process.

Suppliers are responsible for contract storage and transport companies used by them. Transport and storage used must fulfill all requirements for the handling of foodstuffs.

### 1.11. SUPPLIER NOTIFICATION OBLIGATION

The supplier has the obligation to inform Heineken upfront of any change in materials, production processes or machinery if the supplier anticipates any potential effect on bottle quality and brewery processing performance.

## 2. BOTTLE DESIGN & STANDARD SHEETS

### 2.1. DESIGN RESPONSIBILITIES & APPROVAL

**Heineken:**

The responsibilities for the design process and approval of the design are split:

1. **Heineken GSC and Group Commerce** are responsible for all bottles for corporate brands.
2. **The Region or if delegated, the Operating Company** is responsible for bottles for local brands.

**Suppliers:**

Suppliers are responsible to ensure full compliance between Heineken GSC bottle standards and their internal bottle design and production specifications. Heineken GSC will not nor is obliged to sign-off any supplier bottle design or production standard in above sense.

Suppliers shall state on their internal bottle standard the text “Compliant with Heineken GSC standard” followed by the Heineken GSC standard identification and version number.

### 2.2. STANDARD FILL LEVELS AND DIAMETERS

New bottle designs for Corporate brands must comply with the standard fill levels and diameters as listed in the table below.

<table>
<thead>
<tr>
<th>Contents (cl)</th>
<th>Diameter (mm)</th>
<th>Fill level (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>48.5</td>
<td>43</td>
</tr>
<tr>
<td>20 &amp; 20.7</td>
<td>52.5</td>
<td>43</td>
</tr>
<tr>
<td>25</td>
<td>56.6</td>
<td>43</td>
</tr>
<tr>
<td>33</td>
<td>60.4</td>
<td>43</td>
</tr>
<tr>
<td>35.5</td>
<td>60.4</td>
<td>43</td>
</tr>
<tr>
<td>50</td>
<td>69.6</td>
<td>55</td>
</tr>
<tr>
<td>60 to 75</td>
<td>73.7</td>
<td>65</td>
</tr>
<tr>
<td>100</td>
<td>87.3</td>
<td>75</td>
</tr>
</tbody>
</table>

### 2.3. REQUIREMENTS BOTTLE STANDARD SHEET

The bottle design is specified by the individual glass bottle standard sheet.

Required identifications of standard sheets are:

1. For Corporate brands each bottle standard shall have a unique identification, conforming with “Standard identification & version management”.
2. For local brands, the identification is according to local policies.


For all corporate or local bottles standard sheets, the drawings shall contain minimum:

**A: Main drawing:**

1. Drawing of the bottle with dimensions and tolerances in mm.
2. Indication of nominal liquid contents in ml.
3. Indication of fill level in mm measured from the top.
4. Indication of tipping angle in degrees.
5. Reference to the applied crown finish.
6. Indication of the applied glass production technology (B&B, PB or NNPB).
7. Mandatory engravings:
   a. Contents (according legal requirements).
   b. Fill level in mm.
   c. Manufacturer Identification logo.
   d. Year and/or optional quarterly code (returnable bottles only).
   e. Mould number.
   f. Mould dot code.
   g. Reversed Upsilon sign for bottles intended for sale in EU (if legally required).

**B: Detail drawings:**

1. A separate detailed drawing of the engravings / embossing including dimensions in PDF or preferably dxf/dwg format.
2. Detail drawings of bottom and heel section.
3. Other, if applicable.

For corporate brands bottle standard sheets the bottle name to be applied is:

1. Full brand name.
2. Contents in ml.
3. For longneck designs the letters "LN".
4. Indication of one-way "ow" or returnable "ret".
5. For bottles with embossment the embossed text between brackets.

**Examples:**

- Full bottle name:
  - Heineken 330 LN ow.
  - Heineken 500 LN ret (Star + Heineken).
  - Amstel Pulse 330 ow.

### 3. GLASS BOTTLE FINISHES

#### 3.1. GENERAL

On all bottles within the scope of this document only specific Heineken finishes may be applied.

For existing bottles implement Heineken finishes at the earliest possible occasion, however latest per medio 2010, in agreement with the Heineken affiliate.
In case of closures requiring another type of finish, a derogation request shall be applied according to Deviation from this standard.

### 3.2. CROWN FINISHES

The Heineken crown finishes are published in Annex 5. Heineken crown finishes

<table>
<thead>
<tr>
<th>Type of finish</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Heineken A: Pry-off crown finish low</td>
<td></td>
</tr>
<tr>
<td>Heineken B: Pry-off crown finish high</td>
<td></td>
</tr>
<tr>
<td>Heineken C: Twist-off crown finish low</td>
<td></td>
</tr>
<tr>
<td>Heineken D: Twist-off crown finish high</td>
<td></td>
</tr>
<tr>
<td>Heineken E: Finish Maxi Crown rip cap</td>
<td></td>
</tr>
</tbody>
</table>

### 3.3. SCREW CAP FINISHES

The Heineken screw cap finishes for roll-on or plastic closures are published in Annex 5. Heineken crown finishes

<table>
<thead>
<tr>
<th>Type of finish</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>28 MCA-I</td>
<td></td>
</tr>
<tr>
<td>28 MCA-II</td>
<td></td>
</tr>
</tbody>
</table>

### 4. MATERIAL STANDARD

All materials including coatings and permanent decoration materials shall comply with the Heineken GSC standards.

Consult paragraph ‘Packaging Integrity & Legal Standards’ in the Packaging Material Quality Manual.

For the list of approved hot- and cold-end coatings see Annex 1. Materials.

For initiation of an ‘amendment request’ of these lists, please contact your local Heineken contact or Heineken GSC, either:

1. GSC Policies: Packaging Policy.

### 5. REQUIREMENTS

#### 5.1. DIFFERENTIATION REQUIREMENTS CORPORATE BRANDS VS. LOCAL BRANDS

Requirements may differ between corporate brands and local brands for parameters not being integrity or legal related.

##### 5.1.1. Corporate brands

All parameters:

Application of both numerical and AQL values listed in the below tables is mandatory. This also applies for the ‘Visual non-conformities’ as listed in Attributive visual non-conformities.

##### 5.1.2. Local Brands

All parameters:

a) Application of both numerical and AQL values of parameters marked ‘Y’ in below tables is mandatory.

b) Application of both numerical and AQL values of parameters marked ‘N’ in below tables is not mandatory. The use of deviating values of marked “N” parameters is upon local management decision.

#### 5.2. ANALYSIS METHODS

The analysis methods used to determine the parameter values are listed in Annex 3. List of test and analysis methods.

In case the supplier uses deviating analysis methods, the supplier shall present evidence that these methods are identical in performance and ensure availability of a conversion table or program to recalculate to values of the standard analysis methods as listed.
5.3. INTEGRITY

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Y/N</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal pressure resistance</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Beer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without line simulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>≥ 2</td>
<td>≥ 2.3</td>
</tr>
<tr>
<td>Minimum values</td>
<td>1.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Optional: With line simulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>≥ 1.6</td>
<td>≥ 2.0</td>
</tr>
<tr>
<td>Minimum values</td>
<td>0.9</td>
<td>1.2</td>
</tr>
<tr>
<td><strong>Carbonated soft drinks</strong></td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Without line simulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>2.4</td>
<td>≥ 2.8</td>
</tr>
<tr>
<td>Minimum values</td>
<td>1.7</td>
<td>2.1</td>
</tr>
<tr>
<td>Optional: With line simulation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>≥ 2.1</td>
<td>≥ 2.5</td>
</tr>
<tr>
<td>Minimum values</td>
<td>1.4</td>
<td>1.8</td>
</tr>
</tbody>
</table>

**Notes:**
1. In case of carbonated soft drinks with carbonation level < 6.0 g/l, use beer criteria.
2. In case of carbonation level > 6.0 g/l, use carbonated soft drinks criteria.
3. In case of non-carbonated soft drinks, minimum requirements to be agreed upon between bottle supplier and Heineken affiliate in the bottle design process.

<table>
<thead>
<tr>
<th>Impact resistance (for heel and shoulder)</th>
<th>Y</th>
<th>Lot average value ≥ 1.27 m/s (50 ips)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temper</td>
<td>Y</td>
<td>Individual bottle minimum value ≥ 0.90 m/s (35 ips)</td>
</tr>
</tbody>
</table>

5.4. QUALITY

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Y/N</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity*</td>
<td></td>
<td>Nominal contents: See relevant Technical Standards.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Tolerance for (NN)PB process:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Set-out**:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Contents ≤ 355 ml: -0 &lt; x &lt; + 2.5 ml.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Contents &gt; 355 ml: -0 &lt; x &lt; + 4.5 ml.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Individual bottles:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Contents ≤ 355 ml: -3 &lt; x &lt; + 5 ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Contents &gt; 355 ml and ≤ 710 ml: -5 &lt; x &lt; + 7 ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Contents &gt; 710 ml: -7 &lt; x &lt; + 9 ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Tolerance for B&amp;B process:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Set-out:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Contents ≤ 355 ml: -0 &lt; x &lt; + 2.5 ml.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Contents &gt; 355 ml: -0 &lt; x &lt; + 4.5 ml.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Individual bottles:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Contents ≤ 355 ml: -4 &lt; x &lt; + 6 ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Contents &gt; 355 ml and ≤ 710 ml: -6 &lt; x &lt; + 9 ml</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Contents &gt; 710 ml: -8 &lt; x &lt; + 12 ml</td>
</tr>
</tbody>
</table>

* = Existing mould sets are excepted. Compliance required upon depletion of existing mould sets.
** = Set out: All moulds on the machines during production. (determined over at least one day production).
## Parameter | Y/N | Value
--- | --- | ---
Wall thickness | Y | **Beer**

- Non-returnable bottles:
  - Contents ≤ 500 ml $t_{min} \geq 0.9$ mm.
  - Contents > 500 ml $t_{min} \geq 1.1$ mm.

- Returnable bottles:
  - All contents $t_{min} \geq 1.4$ mm.

**Carbonated soft drinks**

- Returnable & non-returnable bottles:
  - Contents ≤ 500 ml $t_{min} \geq 1.5$ mm.
  - Contents > 500 ml $t_{min} \geq 2.0$ mm.

Notes:
1. In case of carbonated soft drinks with carbonation level < 6.0 g/l, use beer criteria.
2. In case of carbonation level > 6.0 g/l, use carbonated soft drinks criteria
   In case of non-carbonated soft drinks, minimum requirements to be agreed upon between bottle supplier and Heineken affiliate in the bottle design process.

Glass thickness distribution* | N | Blow & blow process:

- Maximum ratio in sidewall $r_{max/min} = 2.5 : 1$
- Maximum ratio bottom $r_{max/min} = 2.2 : 1$

(PP) PB process:

- Maximum ratio in sidewall $r_{max/min} = 2 : 1$
- Maximum ratio bottom $r_{max/min} = 2 : 1$

Note: Bottom = Bottom profile including heel up to the base seam.

Bottom thickness | Y | Beer bottles: All contents $t_{bottom min} \geq 2$ mm.

Carbonated soft drinks: All contents $t_{bottom min} \geq 3.2$ mm.

Crown finish dimensions | Y | See Annex 5. Heineken crown finishes

Hot-end coating treatment | Y | Bottle body:

- No ‘blue shine’ allowed.
- HECM*: 20 - 50 CTU.
- HECM-S*: 14 - 44 CTU,

Crown finish pry-off individual bottle:

FCM: \( \leq 20 \) CTU.

FCM-S: \( \leq 32 \) CTU.

Crown finish twist-off:

FCM: \( \leq 10 \) CTU.

FCM-S: \( \leq 16 \) CTU.

Note:
- HECM = Hot End Coating Meter, FCM = Finish Coating Meter,
- S = System-range of AGR equipment

Cold-end coating treatment | Y | Tilt table indication < 20°

Not allowed inside the bottle.

Neck area as free as possible for label adhesion.

For PSL labeling: minimum surface tension 38 Dyne (immediately before labelling).*

Note: PSL = Pressure Sensitive label

Visual non-conformities | Y | See Attributive inspection on visual aspects

Dimensions | Y | See Parameter inspection

Reversed upsilon sign (Ξ) | Y | For bottles produced intended for sale in EU, the reverse upsilon sign has to be applied in the engraving.

Emblems, dot codes, embossing and engravings protruding from the bottle surface (side wall) | Y | No bottle-to-bottle contact.

Glass color Heineken (emerald) green (only one of the two specified methods may be used) | Y | Helmholtz:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWL (nm)</td>
<td>550</td>
<td>556</td>
</tr>
<tr>
<td>Purity (%)</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>Brightness (%)</td>
<td>60</td>
<td>70</td>
</tr>
</tbody>
</table>

---

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<table>
<thead>
<tr>
<th>Parameter</th>
<th>Y/N</th>
<th>Value</th>
</tr>
</thead>
</table>
| Glass color amber (brown) | N | Notes:  
1. The glass color should be conforming with local markets standards and allow for undisturbed bottle inspection on the filling line where ever applicable.  
2. Glass should have sufficient u.v. absorption to prevent light-struck flavor development.  
Below values are guidelines:  
**Helmholtz:**  
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWL (nm)</td>
<td>576</td>
<td></td>
</tr>
<tr>
<td>Purity (%)</td>
<td>77</td>
<td>83</td>
</tr>
<tr>
<td>Brightness (%)</td>
<td>41</td>
<td>47</td>
</tr>
<tr>
<td>Other glass colors including flint and non-Heineken green</td>
<td>N</td>
<td>The glass color should be conforming with local markets standards and allow for undisturbed bottle inspection on the filling line where ever applicable.</td>
</tr>
<tr>
<td>Bottle body conicity and diabolicity* (relevant for PSL labeling only)</td>
<td>Y</td>
<td>Max. ± 0.1 mm.</td>
</tr>
<tr>
<td>Body seam height (relevant for PSL labeling only)</td>
<td>Y</td>
<td>Max. 0.2 mm in zone intended for labelling</td>
</tr>
<tr>
<td>Body surface unevenness * (relevant for PSL labeling only)</td>
<td>Y</td>
<td>Diameter ≤ 0.2 mm.</td>
</tr>
<tr>
<td>Screen printed bottle strength and print quality</td>
<td>Y</td>
<td>For bottles, containing ACL (screen) print, the same requirements apply as for regular bottles. For additional specific visual non-conformities, see paragraph ‘Attributive visual non-conformities - screen printed bottles’. See also Annex 4, Processing test of screen printed bottles.</td>
</tr>
</tbody>
</table>

* = Guidelines
5.5. LINE PERFORMANCE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Y/N</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermo shock resistance**</td>
<td>Y</td>
<td>No breakage allowed.</td>
</tr>
<tr>
<td>Vertical load resistance</td>
<td>Y</td>
<td>Non-returnable bottles: &gt; 6000 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Returnable bottles: &gt; 7000 N.</td>
</tr>
<tr>
<td>Body ovality</td>
<td>Y</td>
<td>Maximum 2 x body diameter tolerance.</td>
</tr>
<tr>
<td>Crookedness (finish skewness)</td>
<td>Y</td>
<td>Maximum 0.6 mm (2-sided).</td>
</tr>
<tr>
<td>Eccentricity</td>
<td>Y</td>
<td>Maximum 2.5 mm (1-sided).</td>
</tr>
<tr>
<td>Push-up</td>
<td>Y</td>
<td>Minimum 1 mm.</td>
</tr>
<tr>
<td>Maximum bottle breakage on the bottling line caused by non-conforming glass bottles.</td>
<td>Y</td>
<td>Before Pasteurizer: 200 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pasteurizer: 500 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pasteurizer-Palletizer: 200 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warehouse: 10 ppm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The total may not exceed: 750 ppm (0.075 %)</td>
</tr>
</tbody>
</table>

** = Related to glass quality (homogeneity, residual stresses). Not due to f.e. stones.

5.6. DESIGN PARAMETERS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Y/N</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tipping angle indication</td>
<td>N</td>
<td>Stable bottle: tipping angle &gt;17º.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range 16º - 17º: line processing may not be optimal.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Potential instable bottle: tipping angle &lt; 16º.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Annex 8: Explanatory notes.</td>
</tr>
<tr>
<td>Headspace</td>
<td>Y</td>
<td>Min. 4.0 %.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See Annex 8: Explanatory notes.</td>
</tr>
<tr>
<td>Diameter</td>
<td>N</td>
<td>Standard diameters: See Standard fill levels and diameters.</td>
</tr>
<tr>
<td>Fill level</td>
<td>N</td>
<td>Standard fill levels: See Standard fill levels and diameters.</td>
</tr>
<tr>
<td>Dot mould code</td>
<td>Y</td>
<td>No bottle-to-bottle contact. Best practice: 0.2 - 0.4 mm in height.</td>
</tr>
<tr>
<td>Supplier &amp; legal legible text</td>
<td>Y</td>
<td>No bottle-to-bottle contact. Best practice: 0.2 - 0.4 mm in height. Text dimensions according to local requirements.</td>
</tr>
<tr>
<td>Emblems, embossing &amp; logos protruding from surface (side wall)</td>
<td>Y</td>
<td>Min. free space to avoid bottle-to-bottle contact: 0.2 mm relative to straight (vertical) line between largest body diameters.</td>
</tr>
<tr>
<td>Recessed label panel (if applicable)</td>
<td>N</td>
<td>Min. recess 0.2 mm.</td>
</tr>
</tbody>
</table>

6. QUALITY CONTROL

6.1. GENERAL

Below paragraphs contain specific instructions related to glass bottles. For general instructions: Consult the chapter 'Incoming material quality assessment' in the 'Packaging Material Quality Manual'.

6.2. FINAL GLASS BOTTLE INSPECTION BY SUPPLIER

The glass bottle supplier shall ensure by an effective product quality control system that each lot of glass bottles is conforming to the standard.

6.3. INCOMING GLASS BOTTLE INSPECTION BY HEINEKEN AFFILIATE

6.3.1. Quality inspection upon any change

Incoming product inspection by the receiving Heineken affiliate is mandatory in case of new or changed glass bottles, first productions of a new supplier or any change in materials, production machinery or processes at the supplier. Switching rules as defined in the ISO standards 2859 and 3951 apply.

See Annex 6. New or changed product, material, process or equipment.

6.3.2. Regular quality inspection

For ‘incoming product inspections’, performed on a regular basis, the switching rules as defined in the relevant ISO standards are applicable. Only in case the supplier is either ‘approved’ or ‘pre-qualified’ and the Heineken affiliate has confidence in the quality data of the supplier, values as stated in a ‘certificate of conformity’ or obtained during regular production quality control by the supplier may be used for parameters subjected to inspection by variables. This also applies to the parameters ‘Cold-end coating treatment, glass temper and thermo shock resistance’ for attributive inspection.

If a visual inspection is performed, then the Heineken affiliate shall always perform that inspection by itself in order to exclude especially ‘no acceptance’ non-conformities to enter the bottling lines.

6.3.3. EBI inspection in the Heineken affiliate

Automatic empty bottle inspection on the bottling line by means of an EBI may depending on the sensitivity of the machine, result in rejection of non-conformities like small stones, blisters, seam lines and swung baffles which are
within the limits of the standard as listed in Minor non-conformities.

6.4. PROCEDURE NON-CONFORMING PRODUCT

In case a lot of glass bottles is found to be non-conforming or if later in the supply chain non-conforming glass bottles are found, the procedure “Follow-up procedure non-conforming packaging” is to be followed. Within the framework of this procedure the Heineken affiliate should assess for procedure A non-conformities whether the non-conformity in the batch is structural or incidental. Structural non-conformities should be treated strictly according to the procedure while an incidental non-conformity should be treated according to the ‘important’ remark in procedure A. For non-conformities which are not related to consumer safety or legal, nor fall under procedure A, both the Heineken affiliate and the supplier shall do their utmost to minimize the effects, efforts and cost to resolve the issue.

Consult paragraph ‘Follow-up procedure non-conforming packaging’ in the ‘Packaging Material Quality Manual’.

7. LOGISTICS INFORMATION

7.1. PACKAGING & TRANSPORTATION

Glass bottles shall be packed according to the Heineken affiliate palletization scheme and relevant local standards. Where possible, uniform packaging shall be applied to limit diversity and promote exchangeability for identical products. Packaging and transport shall ensure that pallets and bottles can be placed in dry condition on the bottling lines, remain suitable for automatic de-palletization and allow for outside storage during a period of one year.

In case bottles are palletized as bulk glass, pallet foil, top tray and tier sheets (layer pads) shall be applied*. For the pallet the following requirements apply:

1. Proper transport and storage facilities should be guaranteed. Pallets should remain clean inside and outside.
2. The entire unit of transport should be enveloped in shrink or wrap foil.
3. Upon approval by the Heineken affiliate foil is allowed to be applied underneath the pallet.
4. The top tray always must be dry in order to allow the vacuum grippers to pick up the tray.

* = The use of unfoiled, strapped pallets is allowed upon approval by the Heineken affiliate conditionally to:

1. No outside storage allowed.
2. Loading/unloading in covered loading bay.

7.2. TIER SHEETS REQUIREMENTS

In case one-way or returnable cardboard or plastic tier sheets are used, the following requirements apply:

1. Tier sheets:
   a) Plastic tiers shall have fully closed edges.*
   b) Plastic tiers shall be made of food-grade plastics.
   c) One-way cardboard tiers shall be made of kraft board. Maximum Cobb 30° value: 105.
   d) Cardboard tier sheets shall be dry and flat.
2. Returnable tier sheets must be cleaned on every trip prior to use.

3. Absence of potential drop-in contamination or cause for flavor off notes, including, but not limited to:
   a) Glass particles embedded in either side of tier sheet.
   b) Foreign matter/debris on or embedded in either side of tier sheet.
   c) Liquid residue on either side (or interior) of tier sheet.
   d) Soil on either side of the tier sheet.
   e) Exposed fibers or frayed pieces on either side of tier sheet and/or edges of tier sheet.
   f) Tears or breaks on either side and/or edges of tier sheet.
   g) Holes in tier sheet.
   h) Repairs are not allowed.

* = Existing sheets with open edges may be used until depleted from the float. New sheets must comply with the requirements.

7.3. (TOP) TRAY REQUIREMENTS

The top layer of a pallet shall be protected by means of a cardboard top tray. Requirements for the top tray are identical to those for the tier sheets. This also applies for intermediate cardboard trays.

7.4. PALLET SHRINK FOIL REQUIREMENTS

In case bottles are palletized, pallet foil shall be applied. For shrink foil the following requirements apply:

a) Foil thickness 80 - 150 µm.
b) Shrink foil, bi-axial stretched.
c) Suitable for outside storage.
d) Outside storage only: The foil should be u.v. resistant up to 12 months.

7.5. PALLET WRAP FOIL REQUIREMENTS

In case bottles are palletized, pallet foil shall be applied. For wrap foil (= stretch foil) the following requirements apply:

a) Suitable for outside storage.
b) Outside storage only: The foil should be u.v. resistant up to 12 months.

7.6. STORAGE

Where possible glass bottles shall be stored inside or under a roof. To prevent blooming (weathering) in particular temperature fluctuations through the Dew point must be prevented during storage. Glass bottle pallets shall be stored using documented dedicated pallet allocation numbers according to the ‘first in - first out’ principle.

Bottles that are more than 12 months old must not be used without thorough inspection for damage, dust, dirt, and any signs of contamination, especially blooming (weathering). Stock greater than 12 months old may only be used after permission by the Heineken affiliate.

7.7. TRACKING & TRACING

The bottle supplier shall comply with ‘Supplier internal tracking & tracing requirements’. The best possible traceability in combination with FIFO must be applied for those materials which are difficult to trace on accurate basis, i.e. cullets and sand.*
Consult paragraph ‘Requirements packaging material supplier internal tracking & tracing systems’ in the ‘Packaging Material Quality Manual’.

Upon request by the Heineken affiliate, finished glass bottle packaging shall be provided with pallet labels using EAN 128 barcodes in accordance with the standard as described in the ‘Packaging Material Quality Manual’.

8. INTRODUCTION NEW OR CHANGED BOTTLES, MATERIAL, PROCESS OR EQUIPMENT

The procedure published in ‘New or changed bottles, material, process or equipment’ has to be followed in case of:

1. First production of a bottle at any glass supplier.
2. Introduction of a new supplier plant.
3. A new bottle design introduction.
4. A change in existing bottle design.

Only after successful completion of this procedure the materials or corporate brand glass bottle design may be formally released by Heineken GSC or the local Heineken authority for local brands glass bottles. Furthermore upon any change in materials, processes or equipment, introduced by the supplier, Heineken may decide to follow the above procedure or another based upon the impact of the change.
ANNEX 1. MATERIALS

A-1.1. Hot-end coatings

A-1.1.1. Generic hot-end coatings
The following generic hot-end coating materials are in general acceptable for use:
1. Monobutyltinintrichloride.
2. Tin Tetrachloride.
3. Titanium Tetrachloride.
Prior to application any material shall be checked on foam stability and taste influence by a Heineken affiliate and approved by Heineken GSC.

A-1.1.2. Specific hot-end coatings
The following specific hot-end coating materials comply with the requirements as stated in the previous paragraph.

<table>
<thead>
<tr>
<th>Hot-end coatings</th>
<th>Product</th>
<th>Manufacturer</th>
<th>Chemical type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certincoat TC-100</td>
<td>Arkema</td>
<td>Tinoxide</td>
<td></td>
</tr>
<tr>
<td>Imacoat HE-100</td>
<td>Imaca</td>
<td>Tinoxide</td>
<td></td>
</tr>
<tr>
<td>Startin S</td>
<td>Bohemi Chemicals</td>
<td>Tinoxide</td>
<td></td>
</tr>
<tr>
<td>Preglas OZ 41</td>
<td>Pge-Chemie E. pregartner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G Coat H 110</td>
<td>Guldbrandsen</td>
<td>Tinoxide</td>
<td></td>
</tr>
<tr>
<td>GlassChem HOT 99</td>
<td>Glass Chem Consult</td>
<td>Tinoxide</td>
<td></td>
</tr>
<tr>
<td>BNT-coat 100</td>
<td>BNT Chemicals</td>
<td>Tinoxide</td>
<td></td>
</tr>
</tbody>
</table>

Note: For datasheets please contact the coating supplier.

A-1.2. Cold-end coatings

A-1.2.1. Generic cold-end coatings
The following generic cold-end coating materials are in general acceptable for use:
1. Polyoxyethylene Monostearate.
2. Poly Ethylene.
Prior to application any material shall be checked on foam stability and taste influence by a Heineken affiliate and approved by Heineken GSC.

A-1.2.2. Specific cold-end coatings
The following specific cold-end coating materials comply with the requirements as stated in the first paragraph of this Annex.

<table>
<thead>
<tr>
<th>Cold-end coatings</th>
<th>Product</th>
<th>Manufacturer</th>
<th>Chemical type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tegoglas RP-40</td>
<td>Arkema</td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>Tegoglas RP-40 LT</td>
<td>Arkema</td>
<td>PE</td>
<td></td>
</tr>
<tr>
<td>Imacoat CE-50</td>
<td>Imaca</td>
<td>PE</td>
<td></td>
</tr>
</tbody>
</table>

Note: For datasheets please contact the coating supplier.
ANNEX 2. QUALITY CONTROL & LIST OF NON CONFORMITIES

A-2.1. General note on use of ISO 3951 and 2859

For product inspection of glass bottles (large quantities), following strictly the ISO tables often results in sampling quantities, which are not practical. For this reason a minimum quantity sample size has been defined next to a sample size code letter for full inspection.

However this implies that the probability of accepting non-conforming lots is increasing as is the probability of rejecting conforming lots. In case of any doubt about the conformity of the lot, additional extended sampling has to be executed (taking more samples).


A-2.2. Parameters for ‘certificate of conformity’ from supplier

The paragraphs below lists the recommended parameters to be included in a ‘certificate of conformity’, including the underlying data.

Note: Only to be provided upon request of the Heineken affiliate.

A-2.2.1. Variable inspection

<table>
<thead>
<tr>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body ovality</td>
</tr>
<tr>
<td>Bottom thickness</td>
</tr>
<tr>
<td>Crookedness (finish skewness)</td>
</tr>
<tr>
<td>Crown finish dimensions D2, D3 &amp; D4</td>
</tr>
<tr>
<td>Diameter</td>
</tr>
<tr>
<td>Eccentricity</td>
</tr>
<tr>
<td>Fill volume at fill point &amp; brimful capacity</td>
</tr>
<tr>
<td>Glass color</td>
</tr>
<tr>
<td>Height</td>
</tr>
<tr>
<td>Hot end coating thickness</td>
</tr>
<tr>
<td>Impact resistance</td>
</tr>
<tr>
<td>Internal pressure resistance</td>
</tr>
<tr>
<td>Push-up</td>
</tr>
<tr>
<td>Vertical load resistance</td>
</tr>
<tr>
<td>Wall thickness</td>
</tr>
<tr>
<td>Wall thickness distribution</td>
</tr>
</tbody>
</table>

A-2.2.2. Attributive quality inspection

<table>
<thead>
<tr>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold-end coating treatment</td>
</tr>
<tr>
<td>Temper</td>
</tr>
<tr>
<td>Thermo shock resistance</td>
</tr>
<tr>
<td>Visual non-conformities</td>
</tr>
</tbody>
</table>

A-2.3. Incoming product inspection by the Heineken affiliate

For incoming product inspections the following applies:

1. In case of a regular inspection, minimum an attributive inspection on visual aspects must be performed according paragraph Attributive inspection on visual aspects.

2. In case the Heineken affiliate also performs an inspection on variable aspects, also the inspection tables as described in the paragraph Parameter inspection apply.
### A-2.3.1. Attributive inspection on visual aspects

<table>
<thead>
<tr>
<th>Parameter</th>
<th>AQL</th>
<th>Inspection level*</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>size  code letter</td>
</tr>
<tr>
<td>Visual non-conformities</td>
<td>**</td>
<td>I</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S3***</td>
<td>H****</td>
</tr>
</tbody>
</table>

* = Based upon AQL = 0.4, lot size 150.000 - 500.000 or 500.000 and over. See explanatory notes.

** = See paragraph ‘Attributive visual non-conformities’ below.

*** = Only to be used in case the supplier produces regularly consistent good quality.

**** = Based upon AQL ≥ 1.0, lot size 150.000 - 500.000 or 500.000 and over.

For AQL = 0.4 and S3, use size code letter K with n = 125.

### A-2.3.2. Parameter inspection

#### A-2.3.2.1. Variable quality inspection

<table>
<thead>
<tr>
<th>Parameter</th>
<th>AQL</th>
<th>Inspection level</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>size  code letter</td>
</tr>
<tr>
<td>Body ovality</td>
<td>1.0</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Bottom thickness</td>
<td>1.0</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Crookedness (finish skewness)</td>
<td>1.0</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Crown finish dimensions D2, D3 &amp; D4</td>
<td>1.0</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Diameter</td>
<td>1.0</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Eccentricity</td>
<td>1.0</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Fill volume at fill point &amp; brimful capacity</td>
<td>1.0</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Glass color</td>
<td>1.0</td>
<td>-</td>
<td>C</td>
</tr>
<tr>
<td>Height</td>
<td>1.0</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Hot end coating treatment</td>
<td>1.0</td>
<td>-</td>
<td>G</td>
</tr>
<tr>
<td>Impact resistance</td>
<td>1.5</td>
<td>I</td>
<td>M</td>
</tr>
<tr>
<td>Internal pressure resistance</td>
<td>0.65</td>
<td>I</td>
<td>M</td>
</tr>
<tr>
<td>Push-up</td>
<td>0.4</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Vertical load resistance</td>
<td>0.65</td>
<td>S3</td>
<td>J</td>
</tr>
<tr>
<td>Wall thickness</td>
<td>1.0</td>
<td>S3</td>
<td>J</td>
</tr>
</tbody>
</table>

#### A-2.3.2.2. Attributive quality inspection

<table>
<thead>
<tr>
<th>Parameter</th>
<th>AQL</th>
<th>Inspection level*</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>size  code letter</td>
</tr>
<tr>
<td>Cold-end coating treatment</td>
<td>1.0</td>
<td>S2</td>
<td>E</td>
</tr>
<tr>
<td>Temper</td>
<td>1.0</td>
<td>S2</td>
<td>E</td>
</tr>
<tr>
<td>Thermo shock resistance</td>
<td>**</td>
<td>S2</td>
<td>E</td>
</tr>
</tbody>
</table>

* = Based upon AQL = 0.4, lot size 150.000 - 500.000 or 500.000 and over. See explanatory notes.

** = No acceptance
A-2.4. Attributive visual non-conformities

A-2.4.1. General
The following is a non-exhaustive list of non-conformities and the categories these non-conformities belong to. Before adding a non-conformity unknown as yet to the below list, Heineken GSC Policies must be consulted.

In case of disagreement on the addition, an impartial expert accepted by both parties can be consulted, whose judgment will be binding. The same holds for disagreement whether a non-conformity, present in below non-conformity lists, found during inspection, processing or further down in the supply chain, is severe enough to fit in the category of non-conformities Heineken claims it to be in.

"In case of repeated mould related occurrence due to any defect not classified in either Procedure A or B elements, the nature and causes for such occurrences would be discussed between Heineken and Supplier to establish origin and responsibility. In case of any disagreement, an impartial expert decided by both parties would be consulted”

A-2.4.2. No acceptance non-conformities
For acceptance sampling purposes, non-conformities of the ‘no acceptance’ category may not be found during inspection.

Corporate brands and local brands: No acceptance

<table>
<thead>
<tr>
<th>Procedure A elements</th>
<th>Consumer safety &amp; legal related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birdcage (thread of glass from wall to wall).</td>
<td></td>
</tr>
<tr>
<td>Choked (restricted) bore or neck</td>
<td></td>
</tr>
<tr>
<td>False bottom.</td>
<td></td>
</tr>
<tr>
<td>Flanged joint. Sharp and dangerous mould seams.</td>
<td></td>
</tr>
<tr>
<td>Foreign particle (stuck) in bottle.</td>
<td></td>
</tr>
<tr>
<td>Glass membrane.</td>
<td></td>
</tr>
<tr>
<td>Hooked on glass. Sharp glass fragments adhering to the outer surface of the bottle.</td>
<td></td>
</tr>
<tr>
<td>Impurities inside bottles such as: graphite and oil/grease.</td>
<td></td>
</tr>
<tr>
<td>Internal skin blisters which are likely to pulverize.</td>
<td></td>
</tr>
<tr>
<td>Missing, incorrect or illegible (legal) text.</td>
<td></td>
</tr>
<tr>
<td>Open blisters on rim surface or rim blisters likely to pulverize.</td>
<td></td>
</tr>
<tr>
<td>Overpressed finish / sugar rim.</td>
<td></td>
</tr>
<tr>
<td>Rim non-conformities attributable to the supplier, which can lead to rim breaking off.</td>
<td></td>
</tr>
<tr>
<td>Small particles of stuck glass breaking of the finish which can be removed by fingernails.</td>
<td></td>
</tr>
<tr>
<td>Spikes at inside bottom.</td>
<td></td>
</tr>
<tr>
<td>Stuck plug (spikes on internal neck wall).</td>
<td></td>
</tr>
<tr>
<td>Tramp glass (glass fragments which have adhered to the inside of the bottle and which cannot be removed by properly operating flushing or jetting).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procedure B elements</th>
<th>Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checks (cracks) in closing ring (split finish, crizzle finish).</td>
<td></td>
</tr>
<tr>
<td>Foreign bottle.</td>
<td></td>
</tr>
<tr>
<td>Line over finish (LOF) fully from inside till outside top rim.</td>
<td></td>
</tr>
<tr>
<td>Ring finish damage. Chipped closing ring. (snipped, chipped, damaged).</td>
<td></td>
</tr>
<tr>
<td>Unfilled/dipped finish.</td>
<td></td>
</tr>
</tbody>
</table>
A-2.4.3. Major non-conformities

For acceptance sampling purposes an AQL has been assigned.

**Corporate brands and local brands: AQL = 0.4**

If included explicitly as such in a contract between Heineken affiliate and the supplier, Items marked ‘L’ may for local brands only, be considered as a minor non-conformity (AQL = 4.0).

<table>
<thead>
<tr>
<th>M/L</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Blister &gt; 4 mm (the size of the blister is determined by the sum of the axes of the blister form in mm divided by two).</td>
</tr>
<tr>
<td></td>
<td>Cracks through and in neck, body, and bottom.</td>
</tr>
<tr>
<td></td>
<td>Mold seams ≥ 0.4 mm, not being sharp or dangerous.</td>
</tr>
<tr>
<td></td>
<td>Damaged or broken bottles.</td>
</tr>
<tr>
<td>L</td>
<td>Deviating color outside color scale (consistently).</td>
</tr>
<tr>
<td></td>
<td>Distorted (thin) bottom, minimum thickness of bottom ≥ 2 mm.</td>
</tr>
<tr>
<td></td>
<td>Embossment outside bottle diameter causing bottle-to-bottle contact on conveyors.</td>
</tr>
<tr>
<td></td>
<td>Misshaped bottles.</td>
</tr>
<tr>
<td></td>
<td>No hot- or cold-end coating.</td>
</tr>
<tr>
<td></td>
<td>Overhang (&gt;0) or underhang (&gt; 0.15 mm) of horizontal mould seam on crown rim (crown finish might break off when opening a bottle).</td>
</tr>
<tr>
<td>L</td>
<td>Partially pronounced discolored bottle.</td>
</tr>
<tr>
<td></td>
<td>Press folds, deep folds or folds which are sharp and have influence on internal pressure resistance of the bottle.</td>
</tr>
<tr>
<td>L</td>
<td>Push up bottom bottle &lt; 1 mm.</td>
</tr>
<tr>
<td></td>
<td>Sagged bottom causing unstable bottle.</td>
</tr>
<tr>
<td></td>
<td>Stones with a diameter exceeding 1.5 mm or stones causing stress.</td>
</tr>
<tr>
<td>L</td>
<td>Bulk glass packaging is damaged or wet to a degree that automatic de-palletization (if applicable) is hampered or not possible.</td>
</tr>
</tbody>
</table>

A-2.4.4. Minor non-conformities

For acceptance sampling purposes an AQL has been assigned.

**Corporate brands and local brands: AQL = 4.0**

If included explicitly as such in a contract between Heineken affiliate and the supplier, for local brands: AQL = 6.5 may be considered.

<table>
<thead>
<tr>
<th>Minor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeds and small blisters measuring &lt; 2 mm, occurring in numbers greater than 10 per 4 cm² (the size of the blister is determined by the sum of the axes of the blister form in mm divided by two).</td>
</tr>
<tr>
<td>Blisters measuring 2 &lt; x &lt; 4 mm (the size of the blister is determined by the sum of the axes of the blister form in mm divided by two).</td>
</tr>
<tr>
<td>Foreign pieces of glass melted onto the bottle’s external surface (pieces may not be sharp and may not lead to a reduced strength, below minimum requirements).</td>
</tr>
<tr>
<td>Impurities on the glass (outside).</td>
</tr>
<tr>
<td>Less significant cracks (not through and through) on neck and body which do not lead to reduced strength, below minimum requirements (hot cracks).</td>
</tr>
<tr>
<td>Mould seams on the body protruding:</td>
</tr>
<tr>
<td>PSL label zones: &lt; 0.2 mm. *</td>
</tr>
<tr>
<td>PSL outside the label zones &lt; 0.4 mm.</td>
</tr>
<tr>
<td>Paper label zones: &lt; 0.4 mm.</td>
</tr>
<tr>
<td>* = PSL : Pressure Sensitive Label</td>
</tr>
<tr>
<td>Rough neck, body or bottom (cold moulds).</td>
</tr>
<tr>
<td>Small dips on closing ring.</td>
</tr>
<tr>
<td>Small folds, pleats or washboards.</td>
</tr>
<tr>
<td>Stones with a diameter 0.8 &lt; x ≤ 1.5 mm, without stress field around.</td>
</tr>
<tr>
<td>Bottles are wet inside, contain water (more than a few droplets).</td>
</tr>
<tr>
<td>Bulk glass packaging is damaged, not hampering or preventing automatic de-palletization (if applicable).</td>
</tr>
<tr>
<td>PSL labels: Pronounced vacuum boars in the labeling area.</td>
</tr>
</tbody>
</table>
A-2.5. **Attributive visual non-conformities - screen printed bottles**

A-2.5.1. **General**
The following is a non-exhaustive list of non-conformities and the categories these non-conformities belong to. Before adding a non-conformity unknown as yet to the below list, Heineken GSC Policies must be consulted. In case of disagreement on the addition, an impartial expert accepted by both parties can be consulted, whose judgment will be binding.

**Note:**
For screen printed bottles also the general bottle ‘attributive visual non-conformities’ list applies.

A-2.5.2. **No acceptance non-conformities**

For acceptance sampling purposes, non-conformities of the ‘no acceptance’ category may not be found during inspection.

**Corporate brands and local brands: No acceptance**

<table>
<thead>
<tr>
<th>Procedure A elements</th>
<th>Consumer safety &amp; legal related - screen printed bottles</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Damaged or broken rim of the bottle.</td>
</tr>
<tr>
<td></td>
<td>Fixed or loose glass fragments in the bottle.</td>
</tr>
<tr>
<td></td>
<td>Missing, incorrect or illegible legal text.</td>
</tr>
<tr>
<td></td>
<td>Toxic constituents in the ink and/or not in compliance with EU regulations.</td>
</tr>
</tbody>
</table>

**Procedure B elements**

<table>
<thead>
<tr>
<th>Quality - screen printed bottles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural color deviation beyond the limits set.</td>
</tr>
<tr>
<td>Foreign label.</td>
</tr>
<tr>
<td>Ink not color-fast.</td>
</tr>
<tr>
<td>Misprints.</td>
</tr>
<tr>
<td>Printing rubs off.</td>
</tr>
<tr>
<td>Unprinted bottles.</td>
</tr>
<tr>
<td>Vertical misalignment in application between neck and body label ≥ 2 mm.</td>
</tr>
</tbody>
</table>

A-2.5.3. **Major non-conformities**

For acceptance sampling purposes an AQL has been assigned.

**Corporate brands and local brands: AQL = 1.0**

If included explicitly as such in a contract between Heineken affiliate and the supplier, Items marked ‘L’ may for local brands only, be considered as a minor non-conformity (AQL = 4.0).

<table>
<thead>
<tr>
<th>L</th>
<th>Major - screen printed bottles</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Decoration heavily damaged.</td>
</tr>
<tr>
<td>L</td>
<td>Stains.</td>
</tr>
<tr>
<td>L</td>
<td>Decoration filled up with ink.</td>
</tr>
<tr>
<td>L</td>
<td>Misprints or parts of decoration are missing.</td>
</tr>
<tr>
<td>L</td>
<td>One or more colors are missing.</td>
</tr>
<tr>
<td>L</td>
<td>Colors not in register, difference &gt; 0.5 mm.</td>
</tr>
<tr>
<td>L</td>
<td>Decoration upside down.</td>
</tr>
<tr>
<td>L</td>
<td>Decoration inverted.</td>
</tr>
<tr>
<td>L</td>
<td>Decoration dimensions not in accordance with specification.</td>
</tr>
<tr>
<td>L</td>
<td>Vertical misalignment in application between neck and body label 1mm &lt; x &lt; 2 mm.</td>
</tr>
<tr>
<td>L</td>
<td>Labels askew, difference over Heineken bar (or re-calculated to Heineken bar (neck/back label)) &gt;2 mm.</td>
</tr>
<tr>
<td>L</td>
<td>Decoration height &gt;1 mm deviation from specification.</td>
</tr>
<tr>
<td>L</td>
<td>Barcode not readable.</td>
</tr>
</tbody>
</table>
A-2.5.4. Minor non-conformities

For acceptance sampling purposes an AQL has been assigned.

Corporate brands and local brands: AQL = 4.0

If included explicitly as such in a contract between Heineken affiliate and the supplier, for local brands: AQL = 6.5 may be considered.

<table>
<thead>
<tr>
<th>Minor - screen printed bottles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decoration slightly stained or fused (from other bottle).</td>
</tr>
<tr>
<td>Small unprinted parts (holes) in decoration.</td>
</tr>
<tr>
<td>Vertical misalignment in application between neck and body label 0.5 mm &lt; x ≤ 1 mm.</td>
</tr>
<tr>
<td>Labels askew, difference over Heineken bar (or re-calculated to Heineken bar (neck/back label)) 1&lt; x ≤ 2 mm.</td>
</tr>
</tbody>
</table>
ANNEX 3. LIST OF TEST AND ANALYSIS METHODS

A-3.1. List of methods

<table>
<thead>
<tr>
<th>Test Method</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal pressure resistance</td>
<td>ISO 7458 - 2004</td>
</tr>
<tr>
<td>Thermo shock resistance</td>
<td>ISO 7459 - 2004</td>
</tr>
<tr>
<td>Vertical load resistance</td>
<td>ISO 8113-2004</td>
</tr>
<tr>
<td>Impact resistance</td>
<td>ASTM C 368 - 88 and DIN 52 295</td>
</tr>
<tr>
<td>Diameter and ovality</td>
<td>ISO 9058 - 1992</td>
</tr>
<tr>
<td>Height and crookedness</td>
<td>ISO 9009 : 1991 (E)</td>
</tr>
<tr>
<td>Eccentricity</td>
<td>ISO 9008 : 1991 (E)</td>
</tr>
<tr>
<td>Capacity</td>
<td>ISO 8106 : 2005 (E)</td>
</tr>
<tr>
<td>Wall thickness</td>
<td>-</td>
</tr>
<tr>
<td>Crown finish dimensions</td>
<td>-</td>
</tr>
<tr>
<td>Cold-end treatment</td>
<td>CETIE DT, Mebak</td>
</tr>
<tr>
<td>Glass color</td>
<td>Helmholtz (DIN 5033, part 3) or CIE-LAB (Din 6174)</td>
</tr>
<tr>
<td>Push-up</td>
<td>-</td>
</tr>
<tr>
<td>Temper</td>
<td>ASTM C148</td>
</tr>
<tr>
<td>Surface tension</td>
<td>-</td>
</tr>
</tbody>
</table>
ANNEX 4. Test method descriptions

A-4.1. Internal pressure resistance
For internal pressure resistance testing (optional: with simulation).

**Equipment:**
1. AGR ramp pressure tester or equivalent.
2. Optional: AGR line simulator or equivalent.

**Method:**
1. Ramp pressure tester: according to (AGR) manual.

**Specific parameters line simulator:**
1. Slip approximately 50%.
2. Empty, wet bottles.
3. Duration for one-way bottles 2 minutes, for returnable bottles 5 minutes.
4. Number of bottles according to Annex 2.
5. Determination to be executed within 1 hour after simulation.
6. Values to be rounded off to 0.05 MPa.

A-4.2. Thermo shock resistance

**Equipment:**
1. Warm and cold-water bath containers.

**Method:**
1. The bottles are submerged in the hot water bath for 5 minutes.
2. Within 15 - 30 seconds the bottles (filled with hot water) are transferred into the cold-water bath.
3. The bottles remain in the cold-water bath for 30 seconds.
4. The bottles are removed for visual inspection.

**Specific parameters:**
1. Temperature difference $\Delta T = 40^\circ$ C.
2. Initial bottle temperature 15 - 20$^\circ$ C.
3. Recommended hot water temperature 70 ± 1$^\circ$ C.
4. Recommended cold-water temperature 30 ± 1$^\circ$ C.

A-4.3. Vertical load resistance

**Equipment:**
1. AGR vertical load tester or equivalent.

**Method:**
1. According to (AGR) manual.

A-4.4. Impact resistance

**Equipment:**
1. AGR Impact tester or equivalent.

**Method:**

A-4.5. Diameter & ovality

**Equipment:**
1. Flat table.
2. Calibrated micrometer gauge set-up for two point measurement.

**Method:**
1. The diameter of the body is measured by means of a two point measurement.
2. Location of measurements: lower, middle and upper body.

The diameter is the maximum value measured.
The ovally is the difference between the maximum and the minimum values measured.

A-4.6. Height & crookedness

**Equipment:**
1. Flat table.
2. Calibrated micrometer gauge set-up for vertical measurement

**Method:**
1. The distance between the flat table and the top of the finish is measured while rotating the bottle.
2. The maximum and minimum values measured are noted.

The height is the maximum value measured.
The crookedness is the difference between the maximum and the minimum value measured.

Note: Crookedness is also referred to as finish skewness or finish non-parallelism.

A-4.7. Eccentricity
The eccentricity is the horizontal distance between a vertical line through the centre of the finish and a vertical line through the centre of the bottom. Eccentricity is also referred to as verticality.

**Equipment:**
1. Flat table.
2. Bottle rotation & bottom fixation device.
3. Calibrated micrometer gauge set-up for horizontal measurement

**Method:**
1. The center of the bottom is determined and the bottle is held into a fixed position on the rotating device.
2. The bottle is rotated and the maximum and minimum horizontal gauge reading is noted.

The eccentricity difference between the maximum and the minimum value measured divided by two.

A-4.8. Capacity

**A-4.9. Wall thickness**
The wall thickness may be determined by destructive or non-destructive methods. To be measured at three locations over the whole circumference:
1. Top of body.
2. Center of body.

**Equipment:**
1. Vernier caliper for destructive measurement.
2. Capacitive measurement device for non-destructive measurement.
A-4.10. **Crown finish dimensions**

---

A-4.11. **Cold-end treatment**

Cold-end coating performance is determined by means of an evaluation of the static coefficient of friction.

**Equipment:**
1. AGR tilt table or equivalent.

**Method:**
1. 3 bottles in 2 by 1 pyramid configuration.
2. Tilt speed 3.6° per second.
3. After each determination the top bottle is rotated by a full turn.
4. Three measurements are taken.

The average of the three readings is taken as the tilt angle.

A-4.12. **Hot-end treatment**

**Equipment:**
1. AGR HECM, HECM-S, FCM or FCM-S.

Please be aware that the AGR HE coating measurement instruments S-range have an offset of ≈ – 6 CTU for body and as displayed in table below for finish in comparison to the reading of the previous instruments.

<table>
<thead>
<tr>
<th>Range FCM-S (CTU)</th>
<th>Median to add to FCM reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non coated</td>
<td>0.6</td>
</tr>
<tr>
<td>0 - 5</td>
<td>1.3</td>
</tr>
<tr>
<td>6 - 10</td>
<td>5.4</td>
</tr>
<tr>
<td>11 - 15</td>
<td>8.2</td>
</tr>
<tr>
<td>16 - 20</td>
<td>12.3</td>
</tr>
<tr>
<td>21 and over</td>
<td>11.0</td>
</tr>
</tbody>
</table>

Source: AGR International

A-4.13. **Glass color**

**Equipment:**
1. Spectrophotometer.
2. Plan parallel glass plate of 2 mm thickness for green or brown glass and 5 mm for flint glass or a piece of glass from a bottle having approximately the same thickness.
3. Light source producing standard light C (if not incorporated in spectrophoto meter).

**Method:**
1. The colors are measured according to the spectrophoto meter manual.
2. The result is re-calculated to a standard glass thickness of 2.0 mm for all glass colors.
4. Observer angle 2° (CIE 1931).
5. Measurement including reflection.

A-4.14. **Push-up**

**Equipment:**
1. Vernier caliper with side bars.

**Method:**
1. Measure the distance between the straight line over the bottom and the center of the bottle bottom.
2. The value is the push-up.

A-4.15. **Temper**

**Equipment:**
1. Polariscope.
2. Standard strain discs.

**Method:**
Comparison of bottle strain patterns versus standard strain patterns.

A-4.16. **Surface tension**

The surface tension is an indication whether PSL labels will adhere properly to the glass bottle surface.

**Equipment:**
1. Surface tension pencils.

**Method:**
1. Measurement by surface tension pencils.
ANNEX 5. PROCESSING TEST OF SCREENPRINTED BOTTLES

A-5.1. Test procedure screen printed bottle - washing resistance (returnable bottles)

A-5.2. Introduction

Bottle decoration applied via the screen print process is critical with respect to color stability during bottle washing. The color stability, when dealing with any new combination of bottle supplier, printer and packaging line, must be assessed by testing at the Heineken affiliate.

The following test procedure must be followed in order to assess the resistance of the screen print on the bottle with respect to bottle washing. For indication purposes a laboratory test can be performed prior to the bottling line test taking place.

A-5.2.1. Test procedure bottling line

The test must be executed with decorated sample bottles, which must be supplied by the same supplier production site and the same decorator that will supply the actual bottles to be used. Furthermore the test must be executed on the actual bottle washer on which future production runs will be made.

The bottles are sampled at random and processed over the line in a full bottling cycle. The bottles are to be processed 25 times. Individual bottles are to be marked. After each 2 trips, some bottles (depending on the number of bottles available) are to be removed from the lot and kept for evaluation. All bottles collected must comply with the minimum color standard.

Bottle washer conditions:

1. The contact time with caustic should be at least 15 minutes, or more (if a different contact time is applied).
2. Caustic concentration maximum 2.5 % by weight.
3. Only approved additives may be applied.
4. Bottle washer temperatures, caustic and additive(s) concentrations to be monitored in order to assure normal operating conditions (normal maximum operating temperature 80 ± 10 ºC).
5. Additive(s) concentration to be monitored via measurement of surface tension in each compartment of the washer. Concentration according to additive supplier advice.

Evaluation

Bottles, after the test, must:

1. Show no deviation compared to the required minimum (after processing) color standard of the design (fading).
2. Show no traces of ink after rubbing off wet bottles directly after the washer with an absorbing white paper.

Note:

1. Bottle samples to be taken after each trip. If no compliance within the 25 cycles is found, then at least the resistance against a certain number of cycles can be defined.
2. Bottles to be used only as one-way (regardless of the design being one-way or returnable) must pass a washing cycle once according to the same evaluation criteria.

A-5.2.2. Test procedure laboratory

The test described in the following does not replace the washing test, neither does it replace other tests done by the supplier. It merely serves as an indication whether sample bottles are resistant against washing. Sample taking as described under test procedure bottling line.

Method:

The bottles are to be submerged for 3 hours in a bath under the following conditions:

- Temperature 83 ± 3 ºC.
- NaOH concentration 2.5 % by weight.
- Additive concentration: % vol/vol according supplier advice.

Evaluation:

Idem as in test procedure bottling line.
ANNEX 6. HEINEKEN CROWN FINISHES

A-6.1. Heineken A: Pry-off crown finish low

This finish is suitable for ‘blow & blow’ and ‘(narrow neck) press & blow’ processing.
A-6.2. Heineken B: Pry-off crown finish high

This finish is suitable for ‘blow & blow’ and ‘(narrow neck) press & blow’ processing. It is used mostly for ‘blow & blow’ processing.

Where appropriate for existing bottle floats a dimension D4=17.0 ±0.5 mm is allowed.
A-6.3. Heineken C: Twist-off crown finish low

Proper functioning of the closure requires the division of a mould seam at the top of the head.
This finish is suitable for 'blow & blow' and '(narrow neck) press & blow' processing.
This finish is suitable for 'blow & blow' and '(narrow neck) press & blow' processing.
A-6.5. **Heineken E: Finish Maxi Crown rip cap**

This finish is suitable for ‘blow & blow’ and ‘(narrow neck) press & blow’ processing.
A-6.6. Screw cap finish 28 MCA I

28 MCA I

Φ 27.3 ± 0.3
Φ 24.95 ± 0.3
0.25 MAX
Φ 18.1 ± 1

FREESDIAMETER 12.5 mm

Φ 28 ± 0.3
A-6.7. Screw cap finish 28 MCA II

This finish is suitable for roll-on aluminum and plastic closures.
Tests during and after bottle production to be performed on the supplier. The direction and with assumption of responsibility by the premises during the first production run of the bottle. Conducting of all tests shall be done at the supplier's premises to meet the standards. Both Heineken and the supplier that the produced bottles can guarantee the product quality level. It is evident to execution of additional tests shall continue until staff and region, operating company or Heineken affiliate has formal approval for the lot. Only after acceptance of the lot, delivery to the Heineken affiliate may proceed. The first production run to be produced will contain a minimum of 200 pallets. For smaller quantities to be ordered or needed, this procedure can be amended in a practical sense. All tests executed shall be documented in a report.

A-7.5. First production run supervision

During the first production run of corporate brand bottles a GSC assigned representative shall be present to supervise the production start-up and execute the Heineken bottle quality control in case the supplier status is 'pre-qualified' and the region does not have staff with sufficient expertise.

For local brands, approved suppliers and regions with sufficient expertise, a regional representative may perform the supervision and quality control.

A-7.6. First production quality control

After or during production the bottles produced shall be inspected by Heineken staff at the supplier's premises using a tightened inspection schedule. Only after acceptance of the produced lot, delivery to the Heineken affiliate may proceed. The first production run to be produced will contain a minimum of 200 pallets. For smaller quantities to be ordered or needed, this procedure can be amended in a practical sense. All tests executed shall be documented in a report.

A-7.7. Heineken affiliate processing

Under strict supervision of Heineken affiliate staff, the bottles will be processed in the Heineken affiliate. Depending on the quantity of bottles produced, either the whole lot will be processed or only a part according to the 10^th pallet principle. This implies that every 10^th pallet of the lot is used for Heineken affiliate processing while the remaining pallets are stored in the glass factory while awaiting the processing trial results. Only after formal acceptance of the lot by the Heineken affiliate, these pallets may be called-off.

During Heineken affiliate processing the following parameters are to be assessed:

1. Evaluation (in cooperation with the supplier) of all broken bottles.
2. Registration and evaluation of reject levels of inspection equipment (EBI, LBI).
3. Overall line behavior.
4. Bottle breakage:
   a. Before filler.
   b. Filler.
   c. Crowner.
   d. Pasteurizer.
   e. Labeler.
   f. Packer.
   g. Palletizer.
   h. Warehouse.
5. Test to be executed on bottles taken at the end of the line (120 bottles for each test, test to be executed by supplier):
   a. Internal pressure resistance
   b. Impact resistance

A-7.8. Formal approval

ANNEX 7. NEW OR CHANGED BOTTLES, MATERIAL, PROCESS OR EQUIPMENT

A-7.1. Corporate brands

Before initiating any first production at a glass bottle supplier plant for corporate brands all of the below conditions have to be satisfied:

1. GSC Policies has to grant permission for bottle production at the specific glass supplier plant.
2. All conditions mentioned in the last available audit report have to be met, especially the action points for critical non-compliances have to be implemented.

During the production of the glass bottles at the supplier the ‘Inspection Protocol For First Glass Bottle Productions For Corporate Brands’ has to be followed.

The Region may decide to apply the above for local brands.

A-7.2. Initiation

In case of a new bottle design or change, a provisional bottle standard will be drawn up and submitted for approval by the Heineken authority described in Design responsibilities & approval.

In case of a change of coating material, the relevant product data and safety sheet will be submitted for judgment by Heineken GSC. After approval of both, a first production run will be initiated.

A-7.3. Sample production bottle mould

Prior to release of the mould set of any new designed or adjusted bottle by the mould supplier or mould production department of the glass supplier, a sample mould shall be produced and tested in the glass factory on performance. The sampled bottles shall be evaluated on strength and design criteria by the bottle supplier and Region, Operating Company or Heineken affiliate.

Only after a positive evaluation of the trial mould bottles, the order for the production mould set may be released.

A-7.4. First production run

During the first bottle production run, the supplier shall test the bottles according to the supplier routine test procedure and additionally temporarily on a number of parameters if not already included in the supplier routine test procedure. Execution of additional tests shall continue until a stable product quality level can be guaranteed and it is evident to both Heineken and the supplier that the produced bottles meet the standards.

Conducting of all tests shall be done at the suppliers premises during the first production run of the bottles, under the direction and with assumption of responsibility by the supplier.

Tests during and after bottle production to be performed on each bottle mould (cavity):

3. Internal pressure resistance:
   a. After simulation: 1 x during the first production run for each cavity.
   b. Without simulation: 1 x per 2 hours for each cavity.
4. Impact resistance:
   a. Shoulder and heel at the seam - go / no go: 2 x per 2 hours for each cavity.
   b. Shoulder and heel: 1 x per day for each cavity.
5. Vertical load resistance: 1 x per 8 hours.
6. Wall thickness (non-destructive): 2 x per 8 hours.

7. Thickness of the bottom: 2 x per 8 hours.
8. Bottle weight: 1 x 8 hours.
9. Dimensional inspection by variables: 1 x per day.
10. Thermo shock resistance: 1 x per day.
11. Coating inspection (hot end coating on body, neck and crown rim): 2 x per day.
13. Glass distribution (cross-cut): 10 samples per day.

A-7.5. First production run supervision

During the first production run of corporate brand bottles a GSC assigned representative shall be present to supervise the production start-up and execute the Heineken bottle quality control in case the supplier status is 'pre-qualified' and the Region does not have staff with sufficient expertise.

For local brands, approved suppliers and Regions with sufficient expertise, a regional representative may perform the supervision and quality control.

A-7.6. First production quality control

After or during production the bottles produced shall be inspected by Heineken staff at the supplier's premises using a tightened inspection schedule. Only after acceptance of the produced lot, delivery to the Heineken affiliate may proceed. The first production run to be produced will contain a minimum of 200 pallets. For smaller quantities to be ordered or needed, this procedure can be amended in a practical sense. All tests executed shall be documented in a report.

A-7.7. Heineken affiliate processing

Under strict supervision of Heineken affiliate staff, the bottles will be processed in the Heineken affiliate. Depending on the quantity of bottles produced, either the whole lot will be processed or only a part according to the 10^th pallet principle. This implies that every 10^th pallet of the lot is used for Heineken affiliate processing while the remaining pallets are stored in the glass factory while awaiting the processing trial results. Only after formal acceptance of the lot by the Heineken affiliate, these pallets may be called-off.

During Heineken affiliate processing the following parameters are to be assessed:

1. Evaluation (in cooperation with the supplier) of all broken bottles.
2. Registration and evaluation of reject levels of inspection equipment (EBI, LBI).
3. Overall line behavior.
4. Bottle breakage:
   a. Before filler.
   b. Filler.
   c. Crowner.
   d. Pasteurizer.
   e. Labeler.
   f. Packer.
   g. Palletizer.
   h. Warehouse.
5. Test to be executed on bottles taken at the end of the line (120 bottles for each test, test to be executed by supplier):
   a. Internal pressure resistance
   b. Impact resistance

A-7.8. Formal approval
In case all test results are positive, the Heineken authority described in Design responsibilities & approval shall give formal approval for the design or material amendments to the supplier.
ANNEX 8. EXPLANATORY NOTES

Blister
Gaseous inclusions in the glass melt which are removed by refining. Refining agents are introduced to encourage the formation of larger bubbles, which rise more rapidly to the surface of the melt, attracting smaller bubbles on their way. Larger bubbles (diameter \( \geq 0.4 \) mm) which are not removed by refining are known as “blisters”, smaller ones as “seeds” and longitudinally stretched bubbles as “air-lines”.

Body ovality
Body ovality is the difference between the maximum and the minimum diameter of the bottle measured on the body.

Check
A check is a small crack in the glass surface. It is a source of bottle breakage.

Crookedness
Crookedness is non-parallelism to the horizontal plane of the surface of the crown finish by measuring the maximum and minimum height of the bottle.

Eccentricity
The eccentricity (also called verticality) is the horizontal distance between a vertical line though the center of the finish and a vertical line trough the center of the bottom.

Headspace
Above the liquid in the bottle enough room should be left to accommodate the expansion of liquid during pasteurization and due to overfilling. In case the bottle fully fills with expanded liquid the closure either will pop-off or leak, or the bottle will burst due to hydraulic pressure.

The ‘head space’ can be calculated according to two algorithms:

\[
Hs = \frac{\text{brimful capacity} - \text{liquid contents}}{\text{liquid contents}}
\]

(effectively this is gas contents divided by liquid contents)

or

\[
Hs = \frac{\text{brimful capacity} - \text{liquid contents}}{\text{brimful capacity}}
\]

(effectively this is gas contents divided by brimful contents).

Heineken uses the first method as in practice, it provides the clearest information about the remaining gas contents. This generally results in a 2 % reduction in headspace during pasteurization. The remaining headspace to be absorbed by overfilling.

Line simulation
A line simulator is a small rotary table which contains a number of bottles. These bottles rub when the table is rotating, simulating the bottle-to-bottle contact on a filling line. The strength of the bottles after a certain time in the machine is supposed to be equivalent to that on the end of a bottling line.

Lot or batch
A lot or batch is the produced quantity per order. In case an order is not a pre-defined quantity or is a yearly quantity which is produced in several production runs, a lot or batch is the quantity of one production run. If the same product is produced on continuous basis during a prolonged period of time, the lot or batch size is to be chosen such that acceptance sampling according to the ISO standards 2859 and 3951 is practically possible.

General practice is in that case to take as a lot the quantity of one day of production. For glass bottles also the quantity of pallets defined by the supplier a being a lot may be agreed upon.

Push-up
Push-up is the free vertical space between the contact plane of the bottom of the bottle and the first glass in the center of the bottle bottom. A minimum free space is required for some packaging machines to function properly, such as multi packer and labeling machines with bottle orientation.

**Reversed upsilon sign**
The reverse upsilon sign engraved in the bottle is a proof of conformity on the liquid contents of bottles. By applying this sign (and execute the appropriate controls) the bottle supplier can reduce the number of controls considerably.

**Seed**
A seed is a small gas bubble of approximately 0.4 mm or less in diameter, left in glass generally as a result of insufficient refining.

**Temper**
Temper is residual strain in annealed glass containers. Strain shows out in polarized light. In a Polarscope standard, strain discs are used as reference standard against which the colors exhibited by glassware may be compared and interpreted as residual stresses in a bottle. The lower the temper value, the lesser the residual strains.

**Tipping angle**
The tipping angle is a parameter which is an indication of the stability of the bottle during processing in the glass plant and in bottling lines prior to filling. There are several methods for calculation. The basic one is shown in the picture below.

A more complex one takes into account the sideways displacement of the bottle bearing contact point with the horizontal plane, thus resulting in somewhat higher values.