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## 1 Scope

This Linde Standard (LS) specifies the requirements for filling of PERLITE into Coldboxes.

It serves as the basis for a project related Method Statement prepared by PURCHASER.

For Linde Coldboxes the project related LE documents "Method Statement" and "Scope of Work Perlite Filling" shall be available.

## 2 Normative references

This LS contains undated references to incorporate provisions of other publications. The normative references are cited at the respective place in the text and the publications are listed below. Issues valid at the effective date of contract shall apply.

EIGA IGC 146/12/E	Perlite Management
EIGA IGC 170/12/E	Safe Design and Operation of Cryogenic Enclosures
ASTM C549	Standard Specification for Perlite Loose Fill Insulation
LS 152-01	Loose Mineral Wool
LS 152-08	Expanded perlite
LS 489-06	Lift-Check Valves
LS 493-15 Part 1	Coldbox Shell Built-in Parts - Type VA - Inflexible Installation - Globe Valves - Boxinsulation of Perlite
LS 493-15 Part 2	Coldbox Shell Built-in Parts - Type VB - Flexible Installation - Globe Valves - Boxinsulation of Perlite

## 3 Terms and definitions

PURCHASER	Organization responsible for the PERLITE filling of the plant, e.g. client/owner/company, represented by its responsible person
CONTRACTOR	Company expanding and/or filling the PERLITE on site
LE	Linde AG, Engineering Division
PERLITE	Expanded perlite
PFHE	Plate Fin Heat Exchanger
ASU	Air Separation Unit (ASU Coldbox)
HSE	Health, Safety and Environment
PPE	Personal Protection Equipment
MSDS	Material Safety Data Sheet of PERLITE Manufacturer (see sample in Annex A)

## 4 General

In addition to this LS the following documents shall be observed:

- EIGA IGC 146/12/E
- EIGA IGC 170/12/E
- ASTM C549
- LS 152-01

## 5 Material

Perlite is a generic term for a naturally occurring siliceous mineral containing 3 - 6% chemically bonded crystal water, which is mined, crushed, sieved and dried to produce a crude perlite ore with a density of 960-1200 kg/m<sup>3</sup>.

The crude perlite ore is expanded in high-temperature furnaces to expanded perlite with loose densities in the range of 45-60 kg/m<sup>3</sup>. The quality for expanded perlite as bulk material shall be according to LS 152-08.

The crude perlite ore and PERLITE shall be protected against weather and moisture during transport and be delivered to site in their original packaging. It shall be stored without contact to ground, dry and protected against weather influences to avoid humidity penetration. All handling-, storage-, shelf-time-, safety- and healthcare instructions and requirements of the material manufacturer shall accompany the materials during transport and shall be strictly adhered to.

## **6 Filling Procedure**

### **6.1 Preparatory Work**

PERLITE filling shall start only after written release of PURCHASER.

Prior to the start of PERLITE filling all tasks according to Form 01 (Para. 'Tasks of preparatory work') shall have been completed. The completion shall be confirmed by PURCHASER in writing by using the Release Protocol, Form 01.

### **6.2 Material Supply**

- By default, for big quantities of PERLITE, raw crude perlite ore shall be expanded on site by portable perlite expansion furnace equipment. For top-up filling tasks after PERLITE settings, supply by silo trailers or big bags is acceptable.
- Alternatively, expanded PERLITE may be delivered to site by silo trailers or in big bags or similar.

### **6.3 PERLITE Filling**

PURCHASER is responsible to coordinate the filling activities with all other contractors and/or personnel working in the area of the Coldbox.

#### **6.3.1 Activities before and during PERLITE filling**

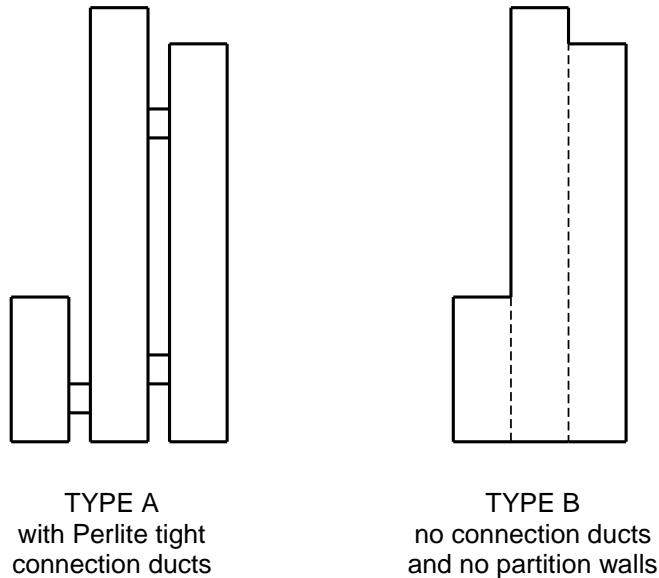
The following activities shall be strictly adhered to before and during PERLITE filling:

- No other working activities in the area of the Coldbox are permitted.
- Prior to the start of filling CONTRACTOR shall ensure that everybody has left the Coldbox and nobody is left behind inside the Coldbox.
- It is strictly forbidden to enter any Coldbox after the filling process has started.
- In case the PERLITE filling shall be done pneumatically, it shall be conveyed with dry and oil-free air.
- The pressure inside the Coldbox shall not fall below ambient pressure to avoid the transfer of humidity into the insulation.
- All openings in the Coldbox shall be protected during filling in such a way, that no rain, snow or moisture can enter the Coldbox. In case the protective measures are not sufficient because of bad weather conditions, the filling shall be interrupted and the box shall be sealed for the period of interruption.
- For non-ASU-Coldboxes with pressure-retention devices, the devices shall be installed prior to the start of perlite filling.
- During filling all gel pots on the roof of ASU's shall be closed with plugs in case the gel filling is already installed.
- During filling all manholes/openings shall be closed apart from those used for exhaust filters or filling.
- During filling all PERLITE-exposed Coldbox relief devices, except relief devices at the highest roof, shall be locked in "transport" or "filling" position with the provided bolting connection.
- Filling from the top of Coldbox is only permitted after written approval from PURCHASER under the consideration of Coldbox height based on the project related Method Statement.
- For ASU-Coldboxes a pressure of up to 0.5 bar is recommended to the piping system inside the Coldbox while the Coldbox relief devices are locked and shall be surveyed by process control system during the whole filling process.
- No pressure higher than 0.5 bar shall be applied to the piping system inside the Coldbox while the Coldbox relief devices are locked.

- Type A Coldboxes (see Figure 1):  
For Coldboxes with different heights and connected to each other by connection ducts with PERLITE partition walls, it is recommended to start filling with the lowest Coldbox.

Type B Coldboxes (see Figure 1):

To prevent voids at Coldboxes with different roof elevations, the area underneath the lower roof shall be filled/topped up completely with PERLITE before the filling continues for higher levels.



**Figure 1: Types of Coldboxes**

- Exhaust filters and/or filter bags shall be installed on all opened manholes and relief devices on the roof. For Type B Coldboxes this shall be only on top of the highest roof.
- The internal pressure of the Coldbox insulation chamber shall be surveyed and recorded by the process control system during filling, see Figure 2 as an example. The maximum allowable pressure inside the Coldbox during filling shall be limited to 12 mbar to avoid opening of side-installed relieve devices.
- The Coldbox shall be purged regularly during filling interruptions with compressed dry and oil-free air to support the sagging and even distribution of the PERLITE.



**Figure 2: Sample Picture from Process Control System**

- Filling shall start at the lowest manhole by connecting the filling hoses with distribution pipes reaching minimum to the Coldbox centre. To prevent dust leaving the box, the filling-manholes shall be covered with filter cloths. Filling shall always be carried out in sections from level to level starting at the bottom moving up to the top.
- The filling heights from level to level shall be specified by PURCHASER and shall be confirmed by CONTRACTOR. The maximum height is 12 meters.
- The Coldbox shall always be filled up to approx. 1 m below the lowest open manhole by moving the distribution pipe to ensure a homogenous spreading and a filling underneath internals. Sectional drawings in different elevations with the location of internal equipment shall be provided by PURCHASER to support and guide the spreading and filling at narrow areas.
- To ensure a homogenous filling of the Coldbox the PERLITE shall be filled from different manholes at the same elevation as far apart from each other as possible. Details shall be given by CONTRACTOR in its detailed PERLITE Filling Procedure.
- Vibration activities to spread the PERLITE are not permitted to avoid any damages of Coldbox internals.
- The quality of the manufactured/filled PERLITE shall be checked and recorded acc. to Para.8.
- It is strictly forbidden to fill in damp PERLITE.
- After filling of a section a visual check shall be performed to verify the proper spreading of PERLITE. Under no circumstances the Coldbox shall be entered for a visual check.
- After a positive visual check witnessing the correct level and the proper spreading of the PERLITE, the safety meshes, the grating covers and the hoses and distribution pipes shall be transferred to the next higher level and the manholes of the lower level shall be closed.
- For safety reasons, at all openings during filling, on top and at the sides, a safety device shall be temporarily fixed in the filling opening to prevent any person or material from falling into the Coldbox. Prior to final closing of openings, the safety devices shall be removed.
- When filling the top section underneath the roof it is necessary to manually spread the PERLITE into every corner and area by the use of suitable tools like stainless steel shovels or rakes.
- For Coldboxes with pressure retention device(s) on the roof, the PERLITE shall not be filled to more than 30 cm below the Coldbox roof to prevent obstruction of the pressure regulator(s).
- During filling the required quality control of PERLITE shall be performed acc. to Para.8.

### 6.3.2 Activities after PERLITE filling

The following activities shall be strictly adhered to after PERLITE filling:

- After finishing the filling process all equipment and tools like hoses, exhaust filters, safety devices, gratings, etc. shall be removed and all manholes and hatches shall be closed and sealed.
- If applicable, the gel pot plugs shall be removed and immediately filled with gel.
- All screwed and clamped connections on the roof such as manholes, gel pots, fittings or bellows shall be checked for leaks.
- All relief devices at the Coldbox casing shall be unlocked and the successful unlocking shall be recorded by PURCHASER.
- After the filling process with the above activities the Coldbox shall be purged within the allowed pressure range with dry oil free air or purge N<sub>2</sub> to keep the PERLITE dry.
- Several weeks after cool-down and operation the PERLITE level shall be checked through the roof manholes. All necessary precautions shall be performed to avoid any harm to personnel due to escaping N<sub>2</sub> gas and due to falling into the PERLITE. The PERLITE shall be topped up if it has slumped and left hollow spaces.
- PERLITE filling from big bags or sacks with at least 1 m<sup>3</sup> volume shall be carried out with provisional funnels and furthermore in the same way as specified before.

- It is strictly prohibited to dump any items other than PERLITE (like for example bags or packing material) into the Coldbox.

## 7 Scope of Detail Engineering

CONTRACTOR shall submit a detailed project related PERLITE Filling Procedure on the basis of this Linde Standard and the project related Method Statement to PURCHASER for approval before starting of any filling activities.

The PERLITE Filling Procedure shall include the specification of responsibilities, storage and handling of perlite materials, filling procedure details, risk assessment, emergency response plan and details about health, safety and environmental issues.

Filling work may only start after written approval of this procedure by PURCHASER.

This procedure shall include but not be limited to the following details:

- Required space for production and/or storage on site,
- Required ground condition for production- and storage area,
- Road blocking,
- Number of expansion furnaces,
- Dimension and weight of the expansion furnaces,
- Production capacity,
- Delivery and storage of crude perlite ore,
- Number of personnel,
- Working sequence, shifts, around-the-clock-work,
- Estimated duration of the whole job,
- Supply of gas or fuel oil,
- Supply of or requirements for electrical power,
- Consumption of electricity,
- Supply of compressed dry and oil-free air or N<sub>2</sub>,
- Transport equipment,
- Lifting equipment,
- Supply of fire-fighting equipment,
- Supply of personnel safety equipment,
- Lighting of the working areas,
- Height of each filling section,
- Sequence of PERLITE filling considering the location of internal equipment at every height including detailed filling instructions in respect to narrow areas,
- Location and number of filling openings,
- Consideration of special requirements for work activities in ex-zones.

## 8 Quality Assurance, Quality Control

CONTRACTOR shall ensure and test the quality of the manufactured/delivered/stored/filled PERLITE following the requirements of LS 152-08, in particular those of Para.4 "Quality assurance". CONTRACTOR shall besides all other requirements of LS 152-08 generate the following quality test reports and submit them to PURCHASER for control and recording:

A.) Signed analysis of the following samples of 1 litre each in comparison to the required values of LS 152-08:

- |                             |   |
|-----------------------------|---|
| On-site expanded PERLITE:   | 1 weight sample every hour<br>2 weight samples per day shall be stored for later analysis   |
| Delivered PERLITE:          | 2 weight samples per each silo wagon taken from top and bottom of the silo<br>1 weight sample from every 4th silo wagon to be stored for later analysis   |
| Temporarily stored PERLITE: | 1 flow capability sample per each 200 m <sup>3</sup> of PERLITE taken from the tent<br>1 humidity sample per each 200 m <sup>3</sup> of PERLITE taken from the tent<br>1 weight sample per each 200 m <sup>3</sup> of PERLITE taken from the tent |
| Filled PERLITE:             | 1 weight sample out of the Coldbox for each filled section  |

CONTRACTOR shall provide qualified personnel and equipment for this testing on site.

The testing shall be witnessed by PURCHASER and the required samples together with the quality test reports shall be regularly handed over to PURCHASER for laboratory testing and filing of the quality test reports.

B.) Signed record of the positive check of each single filled Coldbox-section with max. height of 12 m.

## 9 Health, Safety and Environment

### 9.1 Classification of the Hazardous Potential of the PERLITE Insulation Material

The manufacturer of PERLITE shall examine, classify and identify the insulation materials with respect to their hazardous potential. If the material has to be rated as potentially hazardous, a MSDS shall be attached to the PERLITE Filling Procedure and shall be visibly available on site.

For the rating "harmless" a document of compliance shall be attached to the PERLITE Filling Procedure.

The manufacturer/supplier shall consider the subsequent handling of the insulation material.

### 9.2 Handling of Insulation Material

The supplier of the insulation material shall prepare a risk assessment related to the job site considering the handling of the insulation material being a legal requirement within the scope of local directives.

### 9.3 Protective measures

Expanded perlite is classified as a non-toxic, low risk material. Nevertheless all necessary personal safety equipment shall be used. In particular safety shoes, overalls, gloves, safety goggles, adequate dust masks and hard hats shall be used on site.

#### Caution:

PERLITE products can contain crystalline silica, which is considered to be fine dust. Inhalation of high amounts of any fine dust over long periods can overload the lung clearance mechanism and make the lungs vulnerable to respiratory disease.

Additional special precautions shall be considered if N<sub>2</sub> is used during Coldbox filling.

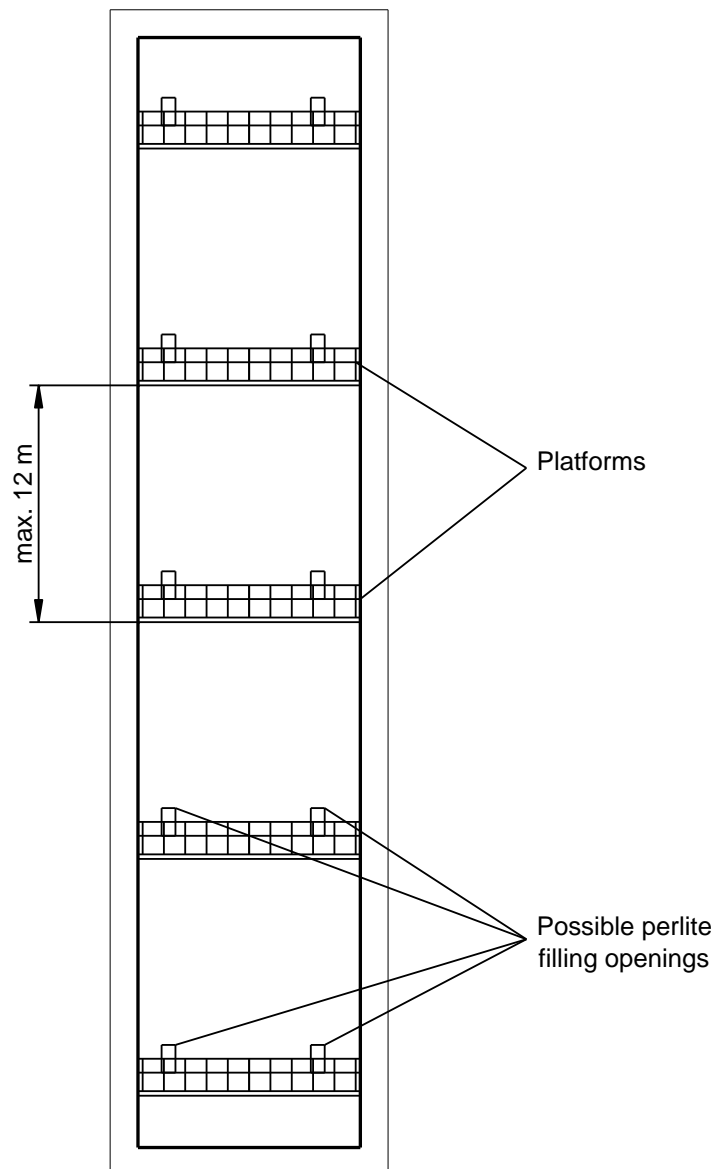
### 9.4 Working with PERLITE

Personnel involved in working with PERLITE shall be trained in safe and correct methods of handling PERLITE and its characteristics and in proper use of PPE. This training shall be recorded. Working crews shall be experienced in PERLITE handling and shall be supervised by CONTRACTOR's site management.

### 10 Principle Sketch Coldbox

As an example a principle sketch for Coldbox is shown in Figure 3.

Project specific drawings shall be provided by PURCHASER.



**Figure 3: Principle Sketch Coldbox**



Annex A  
(informative)

## Sample of MSDS for expanded perlite

SAFETY DATA SHEET  
according to Regulation (EC) No. 1907/2006Product: **CECAPERL** Page: 1 / 5

SDS No.: 899109-003 (Version 2.0)

Date 30.11.2011 (Cancel and replace : 19.05.2008)

## 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Generic Safety Data Sheet

Substance name: CECAPERL

REACH Registration Number: According to REACH regulation, annex IV and V, the substance does not require registration.

Grades : CECAPERL : 10, 20, 40, CY, P

Use of the Substance/Mixture : Mineral load, Cryogenics., Insulation.

Company/Undertaking Identification:  
SupplierCECA  
Charbons Actifs et Agents Filtrants  
Adresse postale : 89 Boulevard National  
92250 LA GARENNE-COLOMBES  
FRANCE  
Téléphone: 01 49 00 38 00  
Télécopie: 01 49 00 38 01  
<http://www.cacachemicals.com>Email address : [ceca.fds@ceca.fr](mailto:ceca.fds@ceca.fr)

Emergency telephone number

+33 1 49 00 77 77  
European emergency phone number : 112  
National Chemical Emergency Centre Tel: 01865 407 333

## 2. HAZARDS IDENTIFICATION

Classification (Regulation (EC) No 1272/2008):

This substance is not classified as dangerous according to Regulation (EC) No 1272/2008.

Classification (Directive 67/548/EEC):

This substance is not classified as dangerous according to Directive 67/548/EEC.

Label elements (REGULATION (EC) No 1272/2008):

This substance does not require a label.

Other hazards:Environmental Effects:

In its normal state, this product does not present any specific risk for the environment.

Physical and chemical hazards:

No special risks of flammability or explosion.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name of the substance<sup>1</sup>: Expanded perlite.

Substance name :

Chemical Name <sup>1</sup> & REACH Registration Number <sup>2</sup>	EC-No.	CAS-No.	Concentration	Classification Directive 67/548/EEC	Classification Regulation (EC) No 1272/2008
Expanded perlite	—	93763-70-3	100 %	WEL substance	

Product: CECAPERL Page: 2 / 5  
SDS No.: 899109-003 (Version 2.0) Date 30.11.2011 (Cancel and replace : 19.05.2008)

**Hazardous impurities :**

Chemical Name <sup>1</sup>	EC-No.	CAS-No.	Concentration	Classification Directive 67/548/EEC	Classification Regulation (EC) No 1272/2008
Quartz (SiO <sub>2</sub> )	238-878-4	14808-60-7	< 1 %	WEL substance	
Cristalline silica, respirable fraction < 10µm	—		< 1 %	Xn; R48/20	STOT RE 1 (Inhalation); H372

<sup>1</sup>: See chapter 14 for Proper Shipping Name  
For the full text of the R, H, EUH-phrases mentioned in this Section, see Section 16.

**4. FIRST AID MEASURES****Description of necessary first-aid measures, Most important symptoms/effects, acute and delayed:****General advice:**

Remove soiled/dirty clothing, brush well and wash carefully.

**Inhalation:**

Move patient from contaminated area to fresh air. Blow nose. In case of persistent problems : Consult a physician. If dust inhalation is severe : move operator to fresh air, wash mouth and throat with plenty of water.

**Skin contact:**

Wash immediately, abundantly and thoroughly with soap and water.

**Eye contact:**

Wash well-open eyes immediately and abundantly with water for at least 15 minutes. If irritation persists, consult an ophthalmologist.

**Ingestion:**

Rinse mouth with water. In case of problems : Consult a doctor.

**5. FIREFIGHTING MEASURES****Extinguishing media:**

Suitable extinguishing media:

Incombustible product., Use suitable means to extinguish neighbouring fires.

Specific hazards:

No data available.

**Advice for firefighters:**

Special protective actions for fire-fighters:

In the event of fire, wear self-contained breathing apparatus.

**6. ACCIDENTAL RELEASE MEASURES****Personal precautions, protective equipment and emergency procedures:**

Avoid breathing dust. Do not crush, avoid the formation and spread of dust in the air. Appropriate breathing apparatus and safety goggles are recommended.

**Environmental precautions:**

Prevent product from entering drains.

**Methods and materials for containment and cleaning up:****Methods for cleaning up:**

Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

Elimination: See chapter 13

**7. HANDLING AND STORAGE****Precautions for safe handling:****Technical measures/Precautions:**

Use suitable methods of discharge and handling to prevent dust generation.

Safe handling advice:

**Product:** CECAPERL Page: 3 / 5  
**SDS No.:** 899109-003 (Version 2.0) Date 30.11.2011 (Cancel and replace : 19.05.2008)

Smoking, eating and drinking should be prohibited in the application area. Appropriate breathing apparatus and safety goggles are recommended. Do not crush, avoid the formation and spread of dust in the air.

**Hygiene measures:**

Provide adequate ventilation. See heading 4.

Wash hands after handling. Remove contaminated clothing and protective equipment before entering eating areas.

**Conditions for safe storage, including any incompatibilities:**

Keep container tightly closed in a dry and well-ventilated place.

**Packaging material:**

**Recommended:** Aluminium containers for trucks., Paper bags, Polypropylene big bags

**Specific use(s) (End Use):** None.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**CONTROL PARAMETERS:**

**Exposure Limit Values (dust)**

Source	Date	Value type	Value (ppm)	Value (mg/m3)	Remarks
EH40 WEL	2007	TWA	—	4	Respirable dust.
EH40 WEL	2007	TWA	—	10	Inhalable dust.
ACGIH (US)	2008	TWA	—	10	Inhalable particles.
ACGIH (US)	2008	TWA	—	3	Respirable particles.

**Derived No Effect Level (DNEL):** No data available.

**Predicted No Effect Concentration (PNEC):** No data available.

**EXPOSURE CONTROLS:**

**Personal protective equipment:**

Respiratory protection:

Appropriate normalized breathing apparatus is recommended.

Hand protection:

Impervious gloves

Eye/face protection:

Safety goggles, Eye wash bottle with pure water

Skin and body protection:

Protective suit

**Environmental exposure controls:** See chapter 6

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance:**

**Physical state (20°C):**

solid

**Form:**

powder

**Colour:**

white

**Odour:**

None.

**Olfactory threshold:**

Not relevant

**pH:**

Concentration 10 %, pH 6,5 - 10, In water depending on grade

**Melting point/range :**

> 1.000 °C

**Boiling point/boiling range:**

No data available.

**Flash point:**

not applicable

**Evaporation rate:**

No data available.

**Flammability (solid, gas):**

No data available.

**Vapour pressure:**

No data available.

**Vapour density:**

No data available.

**Relative density:**

No data available.

**Bulk density:**

various depending on grade

**Water solubility:**

Negligible

**Partition coefficient: n-octanol/water:**

No data available.

**Autoignition temperature:**

No data available.

**Product:** CECAPERL Page: 4 / 5  
**SDS No.:** 899109-003 (Version 2.0) Date 30.11.2011 (Cancel and replace : 19.05.2008)

**Decomposition temperature:** No data available.  
**Viscosity:** No data available.  
**Explosive properties:** No data available.  
**Oxidizing properties:** The substance or mixture is not classified as oxidizing.

## 10. STABILITY AND REACTIVITY

**Reactivity & Chemical stability:**  
 Stable under recommended storage conditions.  
**Conditions to avoid:**  
 No data available.  
**Hazardous decomposition products:**  
 No data available.

## 11. TOXICOLOGICAL INFORMATION

### Toxicological information:

#### Acute toxicity:

#### Local effects ( Corrosion / Irritation / Serious eye damage ):

**Skin contact:** No data available.  
**Eye contact:** Irritation due to dust.

#### Respiratory or skin sensitization:

**Inhalation:** No data available.  
**Skin contact:** No data available.

#### CMR effects :

**Mutagenicity:** No data available.  
**Carcinogenicity:** No data available.  
**Reproductive toxicity:** No data available.

#### Specific target organ toxicity :

##### Single exposure :

**Inhalation:** Possible temporary irritation of respiratory tract. (Physical effect of dust)

##### Repeated exposure:

No data available.

#### Aspiration hazard:

No data available.

## 12. ECOLOGICAL INFORMATION

**Ecotoxicology Assessment:** No known harmful effect on the aquatic environment. Do not dispose large quantities into the natural or aquatic environment.

#### Acute toxicity

**Microorganisms:** No data available.

Product: CECAPERL Page: 5 / 5  
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Persistence and degradability: No data available.

Bioaccumulative potential : No data available.

Mobility in soil : No data available.

Results of PBT and vPvB assessment: No data available.

### 13. DISPOSAL CONSIDERATIONS

#### Waste treatment:

Disposal of product: Uncontaminated product : dispose of at an approved waste disposal site. Used product (filtration product) : dispose of at an approved waste disposal site according to the nature of the original use. In accordance with local and national regulations.

### 14. TRANSPORT INFORMATION

Not classified as dangerous in the meaning of transport regulations.

### 15. REGULATORY INFORMATION

Safety data sheets: according to Regulation (EC) No. 1907/2006  
UK REGULATION Chip3: Chemical (Hazard Information and Packaging for Supply) Regulations 2002

#### INVENTORIES:

EINECS: Conforms to  
TSCA: Conforms to  
AICS: Conforms to  
DSL: All components of this product are on the Canadian DSL list.  
ENCS (JP): Does not conform  
KECI (KR): Conforms to  
PICCS (PH): Conforms to  
IECSC (CN): Conforms to  
NZIOC: Conforms to

### 16. OTHER INFORMATION

Full text of R, H, EUH-phrases referred to under sections 2 and 3

R48/20 Harmful: danger of serious damage to health by prolonged exposure through inhalation.  
H372 Causes damage to organs through prolonged or repeated exposure if inhaled.

#### Thesaurus:

NOAEL : No Observed Adverse Effect Level (NOAEL)  
LOAEL : Lowest Observed Adverse Effect Level (LOAEL)  
bw : Body weight  
food : oral feed  
dw : Dry weight  
vPvB : very Persistent and very Bioaccumulative  
PBT : Persistent, Bioaccumulative and Toxic

This safety data sheet complies with international standard ISO 11014-1. In case of formulations or mixtures, it is necessary to ascertain that a new danger will not appear. The information contained is based on our knowledge of the product, at the date of publishing and it is given quite sincerely. Users are advised of possible additional hazards when the product is used in applications for which it was not intended. This sheet shall only be used and reproduced for prevention and security purposes. The references to legislative, regulatory and codes of practice documents cannot be considered as exhaustive. It is the responsibility of the person receiving the product to refer to the totality of the official documents concerning the use, the possession and the handling of the product. It is also the responsibility of the handlers of the product to pass on to any subsequent persons who will come into contact with the product (usage, storage, cleaning of containers, other processes) the totality of the information contained within this safety data sheet and necessary for safety at work, the protection of health and the protection of environment.

NB: In this document the numerical separator of the thousands is the "." (point), the decimal separator is "," (comma).

Annex B  
(normative)  
**Overview of Forms**

Form	Titel	Issue	File name
Form 01	Insulation - Perlite Filling of Coldboxes - Tasks of Preparatory Work and Release Protocol	01 / 06.2016	LS 151-60.F01 (EN)

Project No.:		Code:	
Coldbox No.:		Order No.:	

## 1 Tasks of Preparatory Work

All of the following listed tasks, but not limited to, shall have been completed and the completion confirmed by PURCHASER in writing prior to start of PERLITE filling:

- ☐ All non-destructive tests, pressure tests and leak tests shall have been successfully completed and recorded.
- ☐ All upper parts of the supporting clamps for side wall installed cryogenic valves (LS 493-15 Part 1, Figure 1, Pos.2) shall have been removed and openings of valve partition boxes have been closed with Aluminium-tape prior to stuffing the bulkheads with mineral wool.
- ☐ All bellows at the Coldbox shall have been sealed.
- ☐ All bulkheads of flanged items, cryogenic fittings, flow measuring devices, etc. shall have been installed, insulated and sealed.
- ☐ All purge gas pipe outlets inside the Coldbox shall have been lagged with glass fibre textile and the purging system shall have been successfully tested and ready for feeding dry and oil free purge gas.
- ☐ The internal Coldbox space, including lateral and diagonal profiles, shall have been completely cleaned and dried by blowing out with dry and oil-free air to remove any residual moisture.
- ☐ In case a separate insulation of PFHE with mineral fibre is required, this insulation work shall have been finished prior to the start of PERLITE filling.
- ☐ Flanged connections inside PERLITE insulation (generally only used for very small Coldboxes or for pump-/turbine ducts) shall be wrapped with mineral fibre and/or glass fibre cloth to protect them from direct contact with PERLITE.
- ☐ All internal scaffolding shall have been completely removed from Coldbox.
- ☐ All necessary safety devices (meshes, nets, barriers, grating covers, etc.) shall have been prepared and fitted to the filling openings, manhole covers and the exhaust openings relief devices on the roof. 8 mbar and 15 mbar relief devices shall have been locked except for filling or venting.
- ☐ During filling all PERLITE-exposed Coldbox relief devices, except relief devices at the highest roof, shall be locked in "transport" or "filling" position with the provided bolting connection.
- ☐ The bottom of the temperature junction boxes shall have been filled with sand covered by a thin concrete layer to ensure gas-tightness.
- ☐ All manhole covers shall have been fitted with their specified seals and have been closed as far as required acc. to Detail Filling Procedure.
- ☐ For ASU-Coldboxes:  
All purge gas vent devices, so called gel pots, shall have been prepared for filling.
- ☐ For Non-ASU-Coldboxes:  
All pressure retention devices (over- and under-pressure check valves S5 and H4 acc. to LS 489-06) shall have been correctly installed (correct colour coding for spring) and checked for right operation. Glass fibre PERLITE protection shall have been installed.
- ☐ All Coldbox relief devices shall have been checked for tightness (complete and glued in rubber gasket) and for correct function.

- ☐ Connection ducts, pump ducts, turbine ducts, bulkheads, etc. belonging to the Coldbox, which are not be filled with PERLITE together with the Coldbox, shall be closed and sealed.
- ☐ If the Coldbox is connected directly to a concrete foundation, all required beams of the Coldbox shall have been sealed with grouted and sealed to the atmosphere.
- ☐ In case of skirt supported vessels inside the Coldbox, the inside of the skirts shall have been insulated separately up to maximum possible level.
- ☐ Plugs/valves of PFHE dummy passages shall have been removed.
- ☐ The inside of the Coldbox shall be free of water.
- ☐ The connection ducts and/or partition walls shall have been checked for PERLITE tightness.
- ☐ Coldbox shell passages for flexible valves acc. to LS 493-15 Part 2 shall have been filled with PERLITE.
- ☐ All hollow sections of equipment or pipe supports shall have been stuffed with mineral wool or filled with PERLITE.
- ☐ All transport supports of equipment or pipes, generally clearly marked with (red) colour, shall have been de-installed and removed as far as possible.
- ☐ Visual tightness checks of Coldbox shell and components which can be potentially un-tight, such as relief devices, manholes, bellows and welded wall plates, shall have been successfully performed.

## 2 Release Protocol

### Statement of Conformity:

All applicable tasks of preparatory work acc. to Para.1 have been successfully executed, ticked and signed by PURCHASER.

The Coldbox is released for the start of PERLITE filling.

Name/Department of PURCHASER representative: ( in capital letters )	
Place:	
Date:	
Signature:	