East Building, PHH-23
1200 New Jersey Ave, SE
Washington, D.C. 20590

U.S. Department of Transportation
**Pipeline and Hazardous Materials Safety Administration**

November 01, 2019

Dr. James M. Shuler
Manager, Packaging Certification Program
Department of Energy
U.S. Department of Energy
1000 Independence Ave, SW
EM-60
Washington, DC, 20585
USA

Dear Dr. James M. Shuler,

As your November 1, 2019 letter requested, Department of Energy has been registered as a user of IAEA Certificate of Competent Authority USA/0825/B(U)-96 for the MANON. This certificate, which revalidates the French Certificate of Competent Authority No.410 authorizes the transport of the package from the point of entry to final destination in the United States, from point of origin in the United States to point of exit, and through the United States.

A copy of the certificate is enclosed. All future revisions of the certificate will be forwarded to Department of Energy at James.Shuler@em.doe.gov.

Sincerely,

Richard W. Boyle, Chief
Radioactive Materials Branch
Office of Engineering and Research

East Building, PHH-23
1200 New Jersey Ave, SE
Washington, D.C. 20590

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

# COMPETENT AUTHORITY CERTIFICATION FOR A TYPE B(U) RADIOACTIVE MATERIALS PACKAGE DESIGN CERTIFICATE USA/0825/B(U)-96, REVISION 0

## REVALIDATION OF FRENCH COMPETENT AUTHORITY CERTIFICATE F/410/B(U)-96

The Competent Authority of the United States certifies that the radioactive material package design described in this certificate satisfies the regulatory requirements for a Type B(U) package as prescribed in the regulations of the International Atomic Energy Agency[1] and the United States of America[2].

1. Package Identification - MANON.

2. Package Description and Authorized Radioactive Contents - as described in French Certificate of Competent Authority F/410/B(U)-96, Revision Ad (attached). Authorized contents are limited to an External Enclosure Assembly (EDCE) containing a Marguerite 20 enclosing strontium 90 sources as described in Appendix 3 of the French certificate.

3. General Conditions -

   a. Each user of this certificate must have in his possession a copy of this certificate and all documents necessary to properly prepare the package for transportation. The user shall prepare the package for shipment in accordance with the documentation and applicable regulations.

[1] "Regulations for the Safe Transport of Radioactive Material, 2012 Edition, No. SSR-6" published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

[2] Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

b. Each user of this certificate, other than the original petitioner, shall register his identity in writing to the Office of Engineering and Research, (PHH-23), Pipeline and Hazardous Materials Safety Administration, U.S. Department of Transportation, Washington D.C. 20590-0001.

c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.

d. Records of Management System activities required by Paragraph 306 of the IAEA regulations[1] shall be maintained and made available to the authorized officials for at least three years after the last shipment authorized by this certificate. Consignors in the United States exporting shipments under this certificate shall satisfy the applicable requirements of Subpart H of 10 CFR 71.

4. Special Conditions -

The Marguerite 20 radioisotopic thermal generator must contain 10 cm of lead surrounding the Sr-90 source on the sides and bottom. Above the source, the Marguerite 20 must have enough copper, steel and air to be equivalent to 18 cm of lead. The Marguerite 20 must further have 1.5 mm of steel surrounding the source on all sides.

5. Marking and Labeling - The package shall bear the marking USA/0825/B(U)-96 in addition to other required markings and labeling.

6. Expiration Date - This certificate expires on March 31, 2020.

**CERTIFICATE USA/0825/B(U)-96, REVISION 0**

This certificate is issued in accordance with paragraph(s) 810 of the IAEA Regulations and Section 173.473 of Title 49 of the Code of Federal Regulations, in response to the October 30, 2018 petition by TN Americas LLC, Columbia, MD, and in consideration of other information on file in this Office.

Certified By:

October 30, 2019
(DATE)

William Schoonover
Associate Administrator for Hazardous Materials Safety

Revision 0 - Issued to endorse the French Certificate of Approval F/410/B(U)-96, Revision Ad, with content limited to an External Enclosure Assembly (EDCE) containing a Marguerite 20 enclosing strontium 90 sources as described in Appendix 3 of the French certificate.

REPUBLIQUE FRANCAISE

AUTORITÉ DE SÛRETÉ NUCLÉAIRE

This document is a translation of :
Certificat d'agrément d'un modèle de colis, F/410/B(U)-96 (Ad), numéro d'enregistrement CODEP-DTS-2017-043883

In case of deviation between the French and English versions, the French version governs.

DIRECTION DU TRANSPORT ET DES SOURCES

**PACKAGE DESIGN APPROVAL CERTIFICATE**



The French Governing Authority,

Pursuant to the request presented by the **Commissariat à l'énergie atomique et aux énergies alternatives** (Atomic energy and alternative energy commission), by letter DPSN/DIR/2017-410 - dated 18 October 2017;

Pursuant to the Package Design Safety Report DS LME50291001 Rev. B - dated 13 July 2012, supported by the note DSN/STMR/LEPE/S-MANON/NOT 0219 Rev. 01 - dated 15 February 2017, note DSN/STMR/LEPE/S-MANON/NOT 0226 Rev. 02 - dated 30 March 2017, mail CEA/DEN/CAD/DSN/STMR DO 465 - dated 20 June 2017 and mail CEA/DEN/CAD/DSN/STMR DO 472 - dated 23 June 2017,

Hereby certifies that:

the package design, comprising the **MANON** casing, described below in appendix 0 rev. d, and:

- loaded with:
  - a modified SV34 packaging, containing cobalt 60 or caesium 137 sources, as described in appendix 1 rev. c;
  - a modified SV69 packaging, containing cobalt 60 or caesium 137 sources, as described in appendix 2 rev. d;
  - an External Enclosure Assembly (EDCE), containing non-removable equipment (AI) holding strontium 90 sources, as described in appendix 3 rev. c;

  is compliant as a **type B(U)** package design;

- when emptied, contaminated or not, equipped with its internal fittings or not, is compliant as a **type B(U)** package design;

with the instructions in the regulations, agreements and recommendations listed below:

- International Atomic Energy Agency (IAEA) regulations for the safe transport of radioactive material, IAEA Safety Standards series, No. SSR-6 2012 edition;
- European Agreement on the International Transport of Dangerous Goods by Road (ADR), International Maritime Code for Dangerous Goods (IMDG code by the IMO);
- decision of 29 May 2009 modified concerning the carriage of dangerous goods by terrestrial routes (TMD decision);
- decision of 23 November 1987 (modified) concerning the safety of ships.



www.asn.fr
15, rue Louis Lejeune • CS 70013 • 92541 Montrouge CEDEX
Téléphone 01 46 16 40 00 • Fax 01 46 16 40 16

This certificate does not exempt the consignor from compliance with any requirements drawn up by the government of any country through or towards which the package will be transported.

This certificate expires on: **31 March 2020**

Registration number: **CODEP-DTS-2017-043883**

Montrouge, 06/11/2017

**On behalf of the President of the ASN**
**and by delegation,**
**the Director for Transportation and Sources.**

**[signature]**

**Fabien FERON**

## SUMMARY OF CERTIFICATE ISSUES

| Issue | Expiry | Type of issue and modifications made | Authority | Type of certificate | Revision index | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Body | t | 0 | 1 | 2 | 3 | 4 | 5 |
| 24/03/2015 | 31/03/2020 | New certificate | ASN | F/410/B(U)-96 | Aa | - | a | a | a | a | - | - |
| 06/10/2017 | 31/03/2020 | Extension to approval (Content 4) | ASN | F/410/B(U)-96 | Ab | - | b | - | - | - | b | - |
| 06/10/2017 | 31/03/2020 | Extension to approval for maritime transport | ASN | F/410/B(U)-96 | Ac | - | c | c | c | c | - | - |
| 06/11/2017 | 31/03/2020 | Extension to approval | ASN | F/410/B(U)-96 | Ad | - | d | c | d | c | - | - |

# APPENDIX 0

## MANON CASING

## 1. CASING DEFINITION

The casing is designed, manufactured, inspected, tested, maintained and used in compliance with the Package Design Safety Report DS-LME50291001 - Rev. B - dated 13 July 2012.

The casing, of a generally cylindrical form, is presented in Figure 0.1.

The concept drawing of the casing and its associated shimmings is RSu LME50291001 Rev. E - dated 14 May 2012.

The overall external dimensions of the casing are:
- height: 2,570 mm ;
- outer diameter: 2,550 mm.

The usable dimensions of the casing are:
- height: 1,704 mm ;
- outer diameter: 1,800 mm.

The maximum permissible weight of the casing during transport is:
- 5,487 kg empty (See Figure 0.1);
- 13,385 kg when it is loaded with the modified SV34 packaging + EDCI and its shimming (See Figure 0.2);
- 15,597 kg when it is loaded with the modified SV69 packaging and its shimming (See Figure 0.3);
- 7,635 kg when it is loaded with the EDCE (See Figure 0.4).

The casing is made up of the principal sub-assemblies described below.

### 1.1. Body

The shell is made up of two cylindrically shaped half-shells made of austenitic stainless steel, each one a welded shell with an inner diameter of 1800 mm and a thickness of 20 mm. Each one of these is then welded to a disk, 20 mm thick, which forms the bottom, and a closing flange. Cut-outs are created in the bases, in order to permit air to flow.

The upper half-shell has a strengthening belt made of austenitic stainless steel, onto which are welded 4 tie-down lugs.

### 1.2. Closing system

The flanges on the two half-shells are made of austenitic stainless steel. The upper flange, with a diameter of 2066 mm and a thickness of 32 mm, is fixed to the lower flange (thickness 30 mm) by 30 x H M30x120 - Class 10.9 screws, torqued to 850 Nm. A centring hole, 10 mm deep, in the body flange, helps to mutually position the two sections.

### 1.3. Shock absorbing systems

The shock absorbing systems of both half-shells are identical . They are made up of phenolic foam DL NU280h, with an axial thickness of 397 mm and a radial thickness of 350 mm, protected by stainless steel plating 3 mm thick, welded onto the half-shells. Their outer casing is cylindrical in shape, with a diameter of 2550 mm.

The shock absorbers are generally in the shape of a ring, into which a recess is machined in order to create an overlapping zone for the protective casing. Passages (notches at 25° and with a 300 mm depth) are created in the covers, in order to allow air to flow. An additional block of foam, independent of the ring, is located within the central axial section. This block is welded onto a puncture protection

plate, made of stainless steel, 20 mm thick, offset by 150 mm from the bottom of the enclosure. This overlaps the cut-outs in the bottom of the half-shells.

### 1.4. Handling and tie-down elements

The handling of the casing (straight lift) is achieved by attaching slings to the 3 studs (onto which are screwed M36 rings, each one with a capacity of 7500 kg during handling phases) welded around the edge of the puncture protection plates on the upper half-shell.

For road or sea transport, the casing is tied-down using straps or flexible turnbuckles, connecting the vehicle to the four tie-down lugs (made of stainless steel X2 CrNiMoN 22-5-3), welded onto the upper half-shell. The tie-down operation, presented in the drawing in Figure 5, is completed in accordance with Standard NF EN 12195-1 in its applicable version and, for maritime transport the CTU code.
The tilt of the tie-down slings is such that they form an angle of:
- 37° with the longitudinal axis of the frame;
- 56.5° with the horizontal axis.

An anti-slip mat, with a coefficient of friction of 0.6, must be placed on the vehicle platform, and under the packaging for maritime transport.

The minimum mechanical properties of the steels used in the upper half shell body and lugs, at a temperature of 83°C, are:
- a yield strength of 450 MPa for the lugs and 349 MPa for the upper half shell body;
- an ultimate tensile strength of 650 MPa for the lugs and upper half shell body.

### 1.5. Safety functions and elements important to safety

The main safety functions and elements important to safety are:
- **impact protection** is principally assured by the shielding on the casing and the phenolic foam blocks in the covers;
- **the dissipation of internal power** is assured by the notches and ventilation openings;
- **fire protection** principally assured by the phenolic foam blocks in the casing, and the insulating materials in the contents (See Appendices);
- **radiological protection** provided by the shielding of the contents (See Appendices);
- **containment**, provided by the containment system around the contents (See Appendices).

## 2. MEASURES TO BE TAKEN BY THE CONSIGNOR PRIOR TO SHIPMENT OF THE PACKAGE

The packaging must be used in accordance with the procedures in the instructions for use, in chapter 05-01 of the Package Design Safety Report.
This is combined with:

- visual inspection that there are no foreign objects within the cavity contents**;**
- inspection**,** at thermal equilibrium of the maximum surface temperature of the casing; in order to assure that the temperature does not exceed ambient temperature plus 10°C, at any point on the surface of the casing;
- for maritime transport, a verification that the anti-slip mat, placed on the platform of the vehicle, is not worn.

## 3. MAINTENANCE PROGRAMME

The packaging must be maintained in accordance with the procedures in the instructions in chapter 05-01 of the Package Design Safety Report.
This programme is combined with a leak test on the thermal fuses, prior to the first transport and during periodic maintenance.

## 4. NOTIFICATION AND RECORDING OF SERIAL NUMBERS

Any packaging being retired from service or whose ownership changes, must be reported to the competent authorities. Accordingly, an owner relinquishing a packaging must provide the name of the

new purchaser.

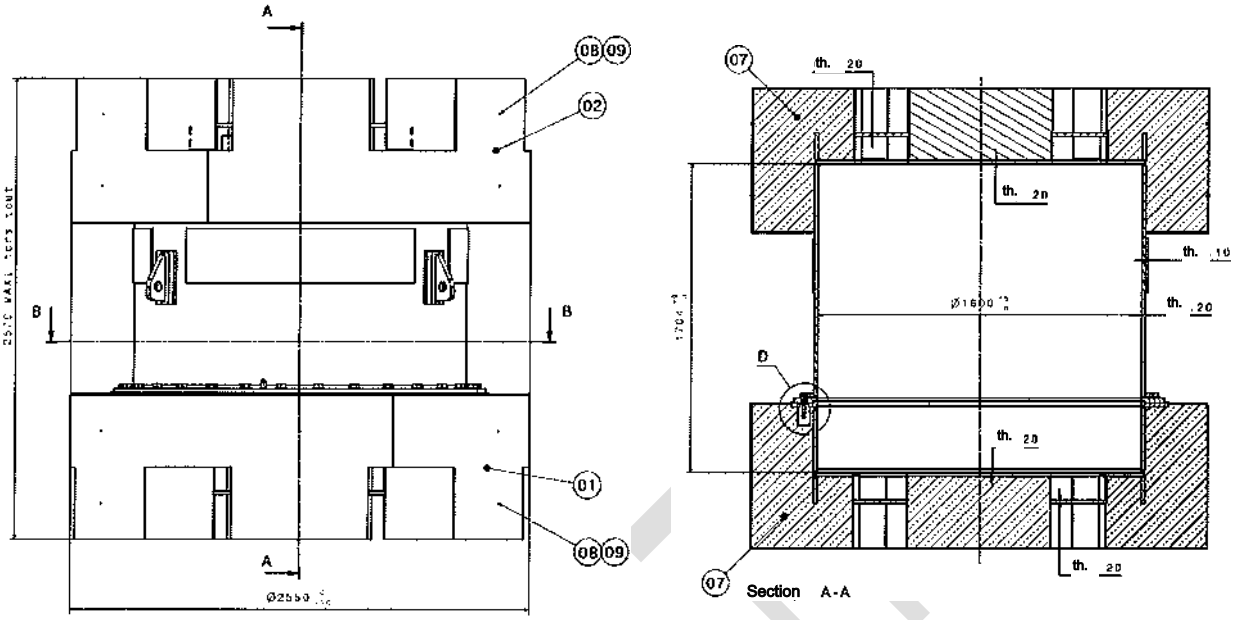
## 5. QUALITY ASSURANCE

The quality assurance principles applied during the design, manufacturing, inspection, testing, maintenance and use of the package must comply with those described in chapter 05-02 of the Package Design Safety Report.

## 6. ADDITIONAL REQUIREMENTS FOR CONTAINED TRANSPORT

If the thermal power of the contents is less than 410 W, transportation within a contained means of transport is authorised.
If the thermal power of the contents is greater than 410W, contained transport methods are not permitted unless otherwise authorised by the Competent Authority.

**FIGURE 0.1**
**DIAGRAM OF THE CASING**



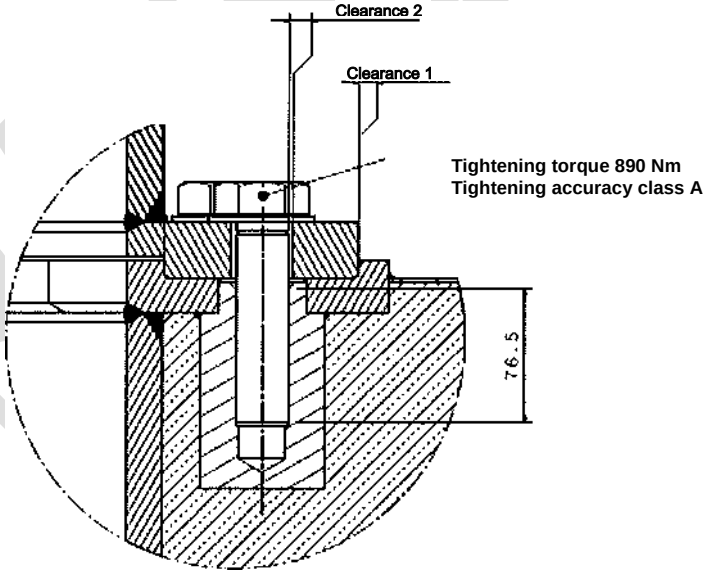



**FIGURE 0.2**
**DIAGRAM OF THE CASING, LOADED WITH A MODIFIED SV34 PACKAGING**

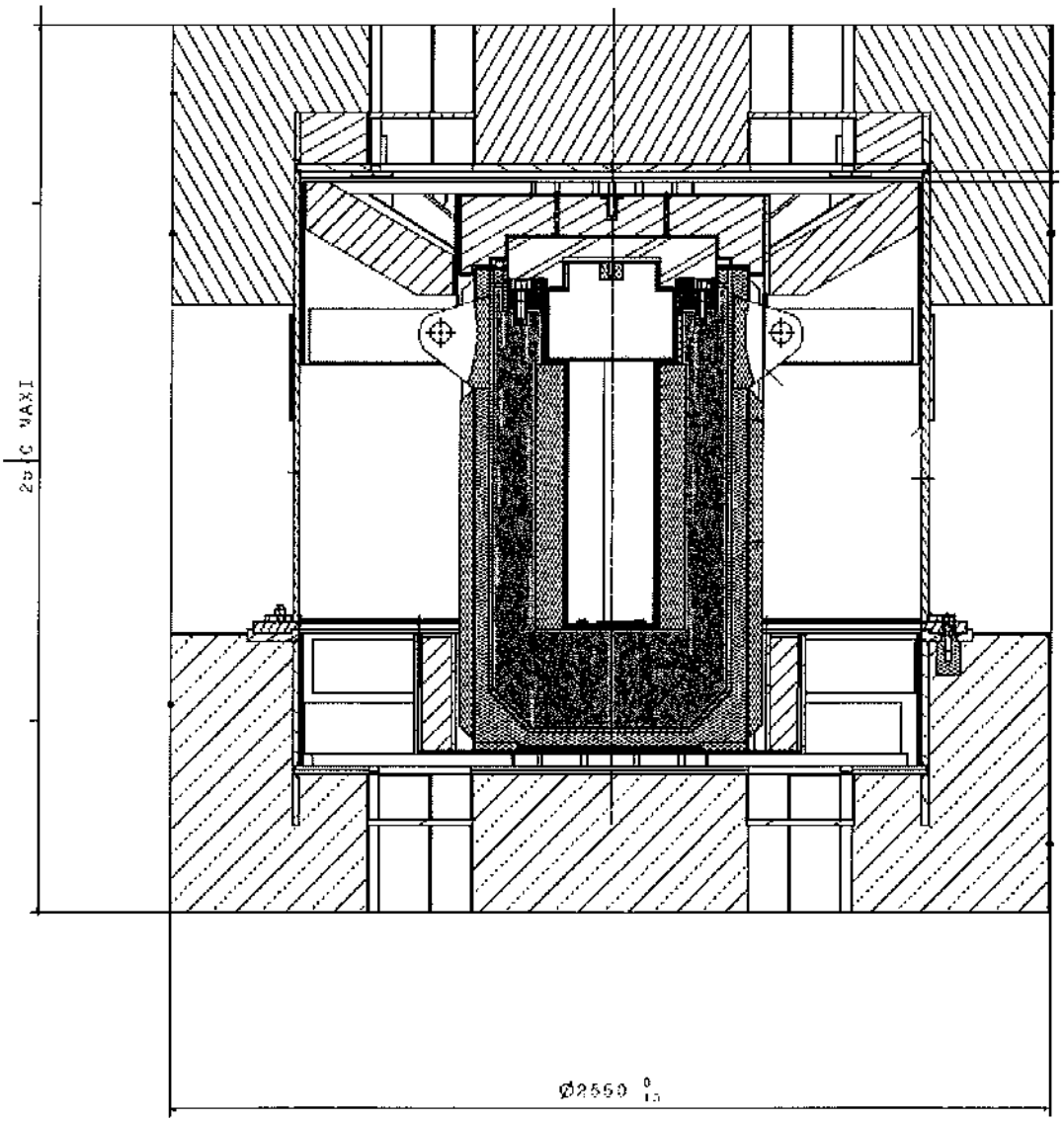
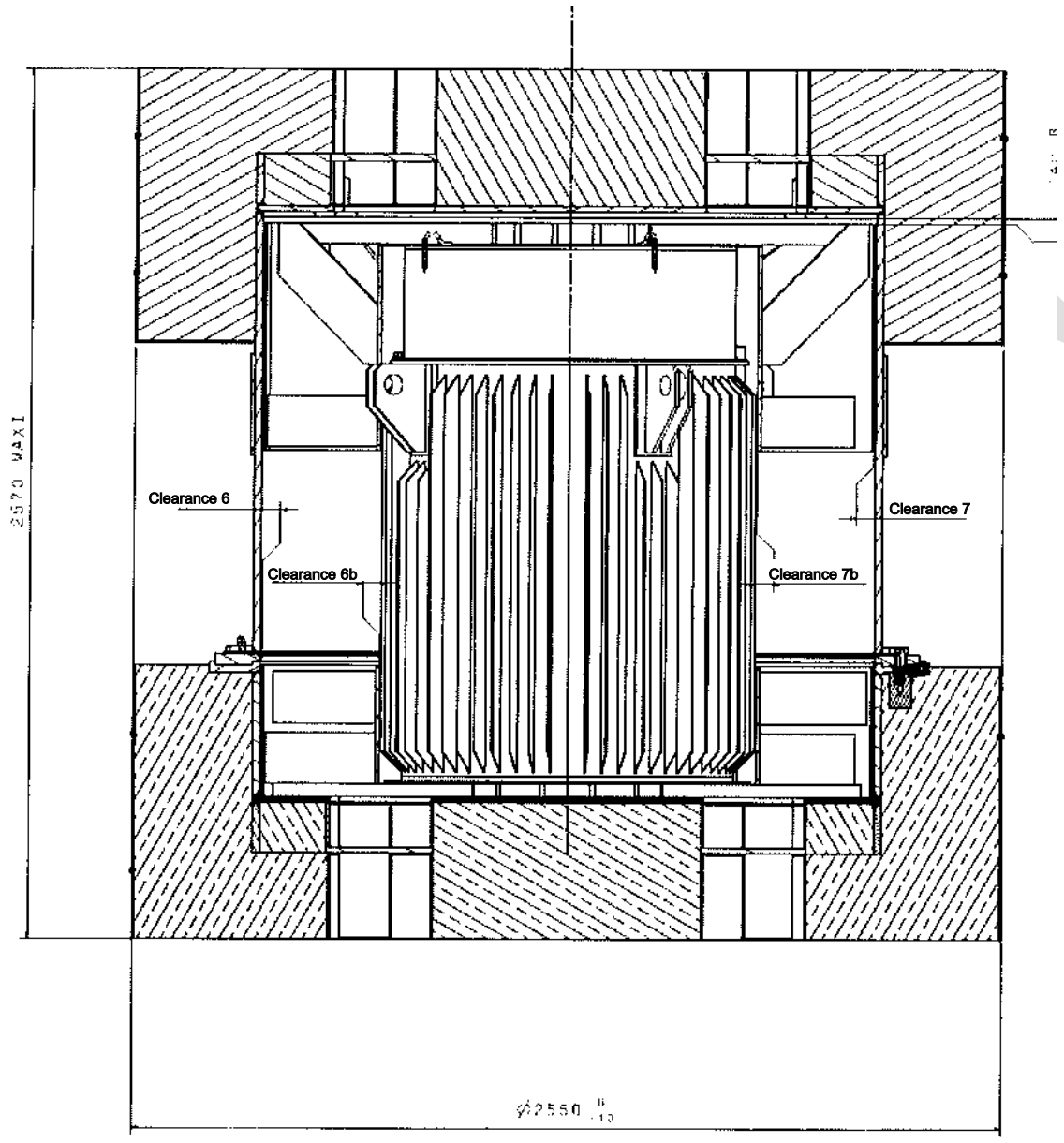


**FIGURE 0.3**
**DIAGRAM OF THE CASING, LOADED WITH AN SV69 PACKAGING**




:10

**FIGURE 0.4**
**DIAGRAM OF THE CASING, LOADED WITH AN EMPTY EDCE**

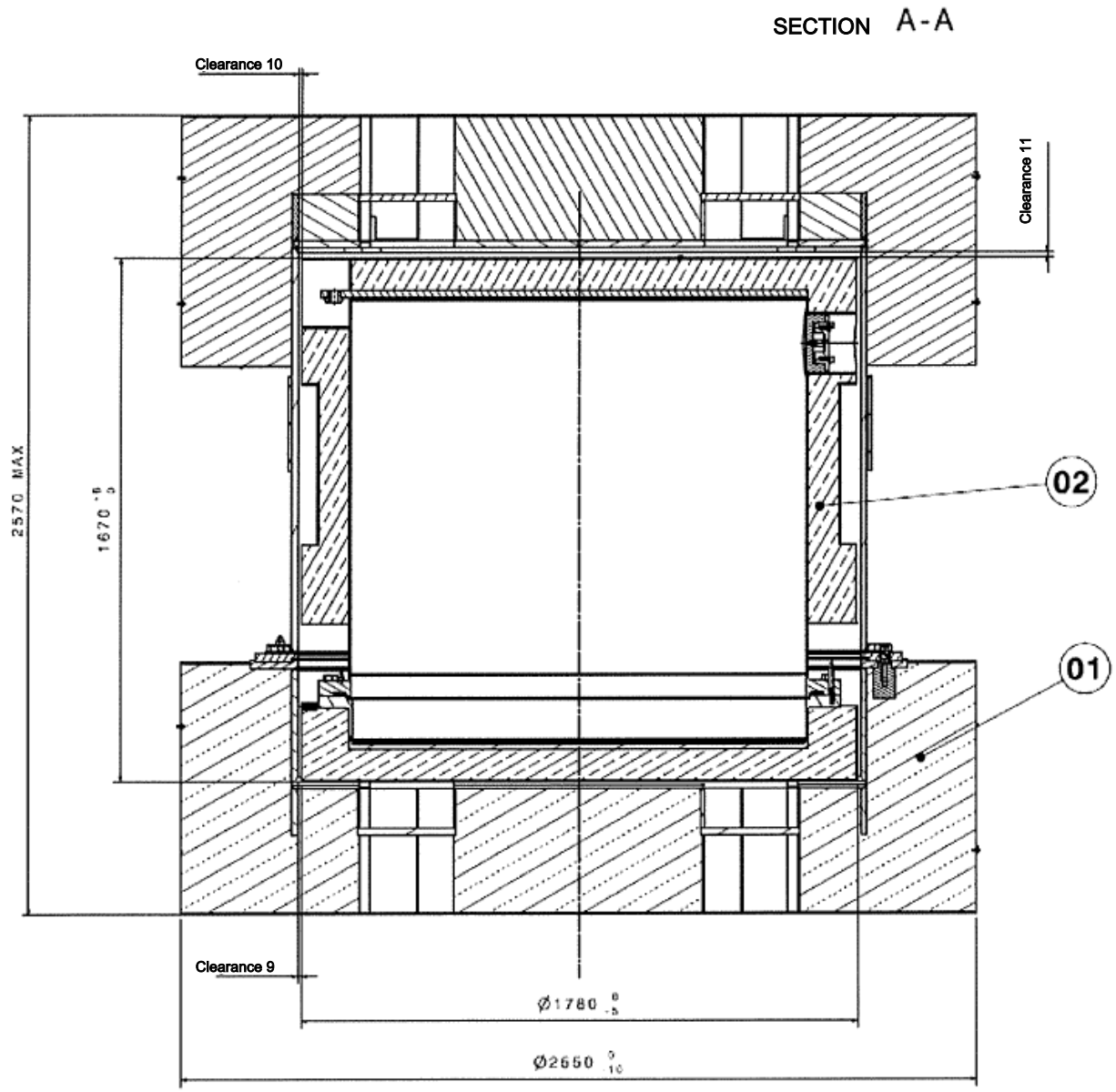
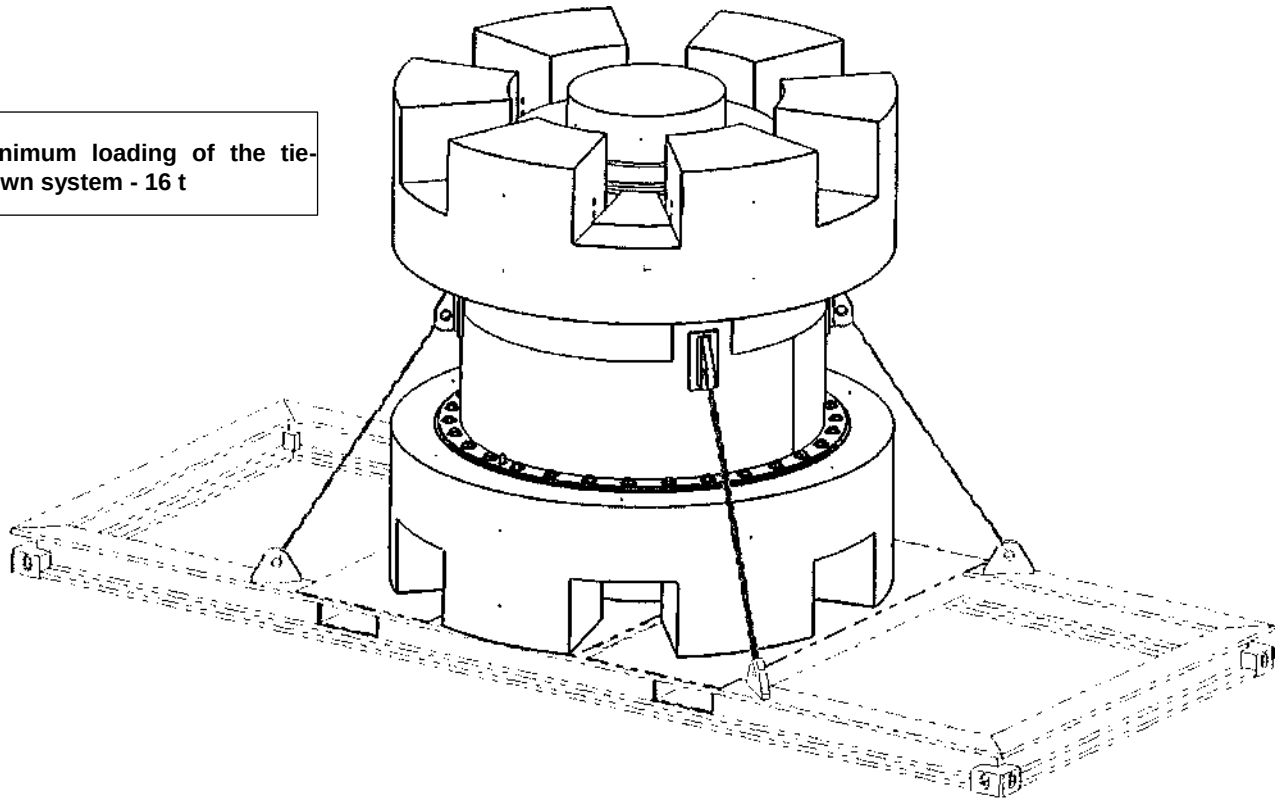


**FIGURE 0.5**
**TIE-DOWN DIAGRAM FOR THE CASING**

**Minimum loading of the tie-down system - 16 t**



**(frame optional)**

# APPENDIX 3

## EXTERNAL ENCLOSURE ASSEMBLY, LOADED WITH NON-REMOVABLE EQUIPMENT

The Package Design Safety Report justifying this content is referenced DS-LME50291001 Rev. B - dated 13 July 2012.

## 1. DEFINITION OF AUTHORISED CONTENT

The authorised radioactive content, as described in Chapters 2 and 3 of the Package Design Safety Report, comprises an external enclosure assembly (EDCE), loaded with one of the following non-removable equipment:

- Marguerite 20 (See Figure 3.3);
- Marguerite 2 (See Figure 3.4);
- Geter 2B (See Figure 3.5);
- GSM 15 (See Figure 3.6);
- Gisete 4 (See Figure 3.7);
- Gisete 5 (See Figure 3.8);
- Isotaaf 1 (See Figure 3.9).

The non-removable equipment encloses strontium 90 sources.

### 1.1. EDCE DESCRIPTION

The EDCE has been designed, manufactured, inspected, tested, maintained and used in compliance with the Package Design Safety Report DS-LME50291001 - Rev. B - dated 13 July 2012. This is combined with the requirement to replace the containment gaskets every 3 years, or every 30 rotations, depending on which one is the more conservative.

The design drawing for the EDCE is referenced 1ME50291050 Rev. C. A diagram of the EDCE is shown in Figure 3.1. The diagrams of these containment systems are presented in Figure 3.2.

The enclosure, in cylindrical form, is made up of two half-shells, an upper and a lower, made of stainless steel. Each half-shell is made up of a cylindrical shell welded at the bottom to a 20 mm thick plate, and at the top to a flange. The two flanges are fastened together by 18 x H M24x100 Class 12.9 screws. Two trapezoidal grooves are machined into the upper flange to hold two EPDM O-ring gaskets.

Inside each half-shell, both axially and radially, there is a layer of phenolic foam DL NU280h, with a minimum thickness of 100 mm, providing both mechanical and thermal protection. The foam is protected by stainless steel plating.

A closure plate, made of stainless steel, protects the EDCE vent self-closing coupling (radially positioned on the upper half-shell). It is attached to the EDCE by 4 x CHc M10x35 Class 10.9 screws. Two trapezoidal grooves are machined into the closure plate to hold two O-ring seals made of EPDM.

The handling of the EDCE is achieved by attaching slings (straight lift) to 3 handling studs (to which are screwed M24 rings, each one with a capacity of 3500 kg during handling phases) situated on the upper half-shell.

The principal dimensions of the EDCE are as follows:
usable diameter : 1,450 mm ;
usable height : 1,428 mm ;
overall diameter : 1,780 mm ;
overall height : 1,672 mm.

The maximum weight of the empty EDCE is 2148 kg.

The containment of the EDCE, loaded with non-removable equipment, is provided by its casing, made up of:

- the two half-shells of the EDCE, their flange, welds and internal EPDM gasket of grade 48DRL13 by STACEM, or EP8517 by Joint Français for the upper shell;
- the protective closure plate for the self-closing fitting and its internal EPDM gasket - type: 48DRL13 from STACEM or EP8517 from Joint Français.

### 1.2. Description of non-removable equipment and radioactive sources

The “non-removable” equipment are of varying geometries, comprising a steel and lead protective cask enclosing one or more strontium 90 sources (in the form of sintered pellets). The following non-removable equipment can be loaded into the EDCE; their activity levels and thermal power at the moment of transportation must not exceed the 2006 estimated value in the table below:

| Identification of non-removable equipment | Overall Base (mm) | Overall height (mm) | Maximum mass (kg) | Activity as of 01/09/06 (TBq) | Thermal power in 2006 (W) |
|---|---|---|---|---|---|
| Marguerite 20 | ∅ 1,100 | 1,330 | 4,000 | 1,699.4 | 309 |
| Marguerite 2 | ∅ 950 | 1,100 | 450 | 10.4 | 2 |
| Geter 2B | ∅ 810 | 800 | 1,965 | 36.0 | 7 |
| GSM 15 | ∅ 380 | 660 | 600 | 25.9 | 5 |
| Gisete 4 | ∅ 853 | 865 | 2,270 | 202.7 | 37 |
| Gisete 5 | ∅ 690 | 1,100 | 1,670 | 1,022.3 | 186 |
| Isotaaf 1 | 790 x 790 | 817 | 212 | 23.3 | 4 |

The GETER 2B non-removable equipment must be transported without its trolley.

The radiological protection for the non-removable equipment is provided by its steel and lead radial and axial thicknesses .

## 2. LOADING CONDITIONS

The loading operation is carried out in accordance with Chapter 05-01 of the Package Design Safety Report DS LME50291001. The container is designed to be handled, loaded and transported in a vertical position.

### 2.1. Before loading

The consignor:

- assures that the container has been correctly maintained in accordance with the inspection and maintenance programme detailed in Chapter 05-01 of the Package Design Safety Report DS LME50291001;

- checks the conformity of the contents to the current Certificate of Approval;
- verifies the general condition of the EDCE container, in particular:
  - the 18 x H M24x100 class 12.9 screws attaching the half-shells, and the associated tapped holes;
  - the 4 x CHC M10x35 class 10.9 screws attaching the closure plate, and the associated tapped holes;
  - the 2 flange and closure plate orifice plugs and tapped holes;
  - the mating surfaces of the flange gaskets and the orifice plugs;
  - the mechanical and thermal protection;
  - the container lifting attachments;
- replaces the flange gaskets and orifice plugs every 3 years, or every 30 rotations, depending on which one is the more conservative.

### 2.2. After loading

The consignor:
- checks the leakage from the EDCE container (standard permissible leak rate of $6.2 \times 10^{-4}$ $Pa.m^3s^{-1}$ SLR) from the inter-gasket space, by decreasing or increasing pressure;
- checks the tightening of the screws:
  - the 18 x H M24x100 - Class 12.9 screws, used to attach the flanges, at a torque of 760 Nm, with accuracy class A , as per Std NF E25-030;
  - the 4 x CHC M10x35 - Class 10.9 screws, used to attach the closure plate, at a torque of 35 Nm, with accuracy class A, as per Std NF E25-030;
  - the 2 flange and closure plate orifice plugs.

### 2.3. During the installation in the casing

The consignor:
- checks for the absence of the lower cage in the lower half-shell;
- after installing the EDCE container, checks the tightening of the 30 x H M30x120 - Class 10.9 screws attaching the two half-shells at a torque of 850 Nm and accuracy class A, as per Std NF E25-030;
- checks the fitting of the safety seals.

## 3. INTERNAL FITTINGS

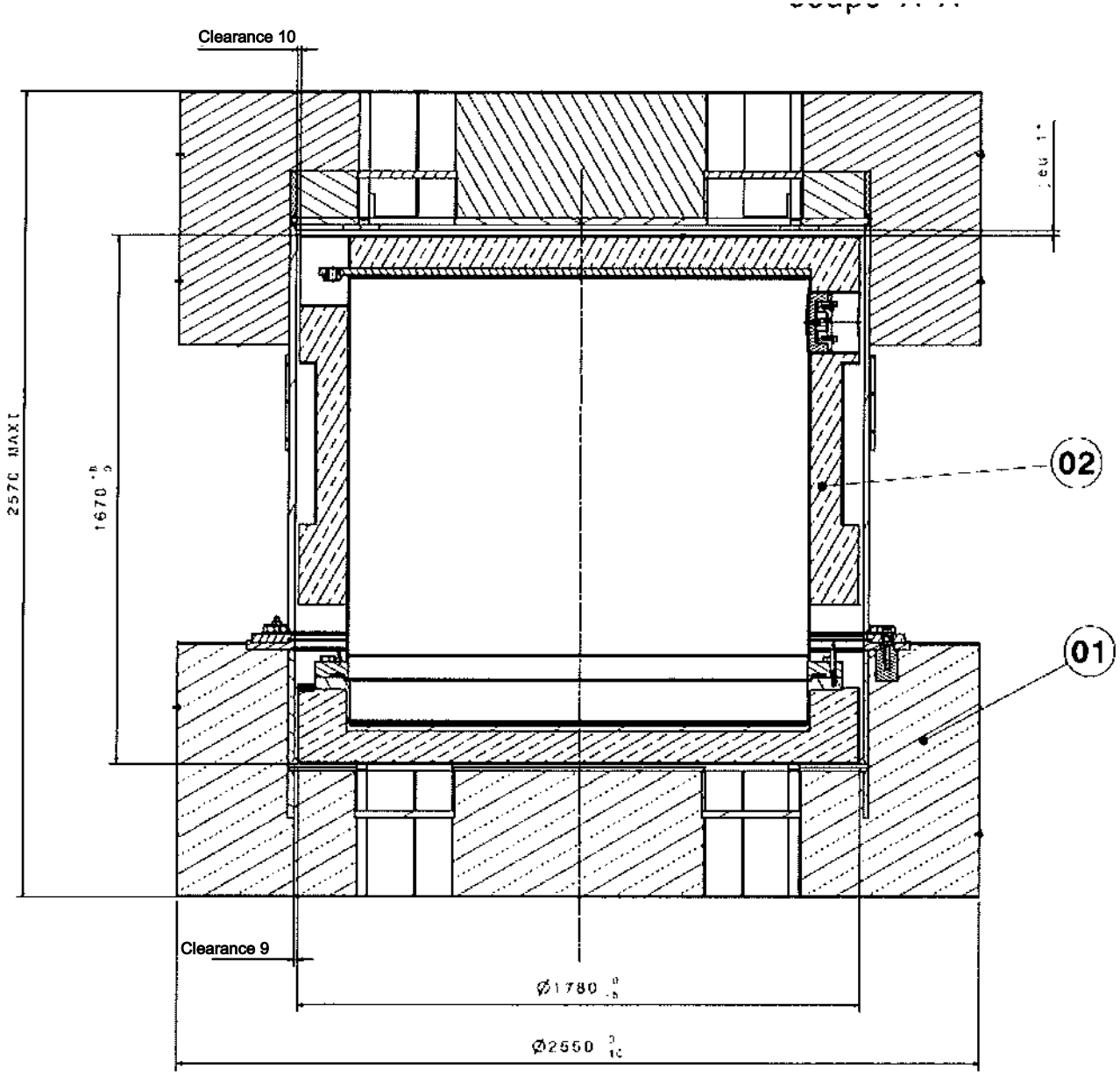
Internal fittings are described in chapter 2 of the Package Design Safety Report.

The EDCE does not have a shimming system inside the casing.

There is a separate shimming system for each type of non-removable equipment. They are manufactured from stainless steel X2 Cr Ni 19-11. For each type of shimming system, the assembly comprises an upper part and a lower part.

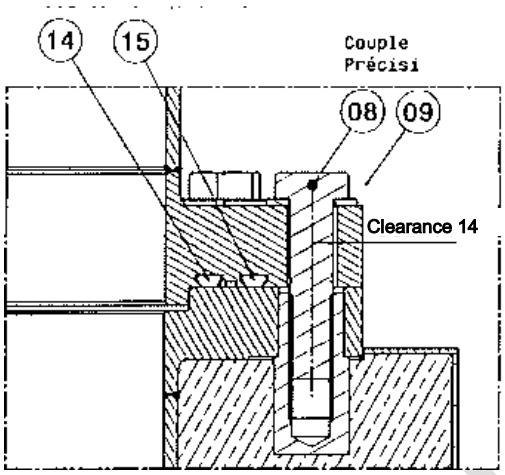
| Non-removable equipment shimming | Outer diameter | Cavity diameter | Maximum mass | Associated drawing |
|---|---|---|---|---|
| Shimming K2 (Marguerite 20) | 1,440 mm | 1 120 mm | 290 kg | 1ME50291520 rev. D |
| Shimming K7 (Marguerite 2) | 1,440 mm | 970 mm | 476 kg | 1ME50291570 rev. D |
| Shimming K4 (Geter 2B) | 1,440 mm | 597 mm | 702 kg | 1ME50291540 rev. D |
| Shimming K6 (GSM 15) | 1,440 mm | 398 mm | 670 kg | 1ME50291560 rev. D |
| Shimming K3 (Gisete 4) | 1,440 mm | 874 mm | 373 kg | 1ME50291530 rev. D |
| Shimming K5 (Gisete 5) | 1,440 mm | 708 mm | 537 kg | 1ME50291550 rev. C |
| ShimmingK8 (Isotaaf 1) | 1,440 mm | 800 mm | 763 kg | 1ME50291580 rev. D |

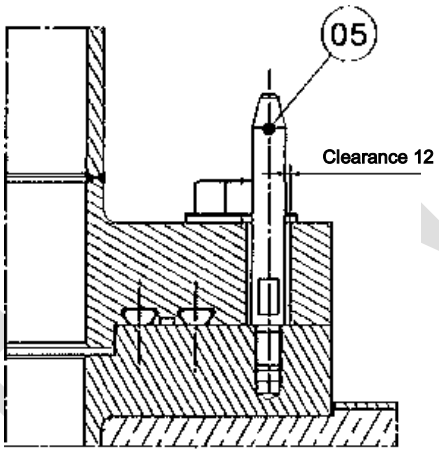
**FIGURE 3.1**
**EDCE DIAGRAM**



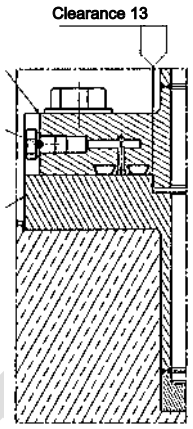
## FIGURE 3.2
## DIAGRAMS OF THE EDCE CONTAINMENT SYSTEM

**EDCE flange**

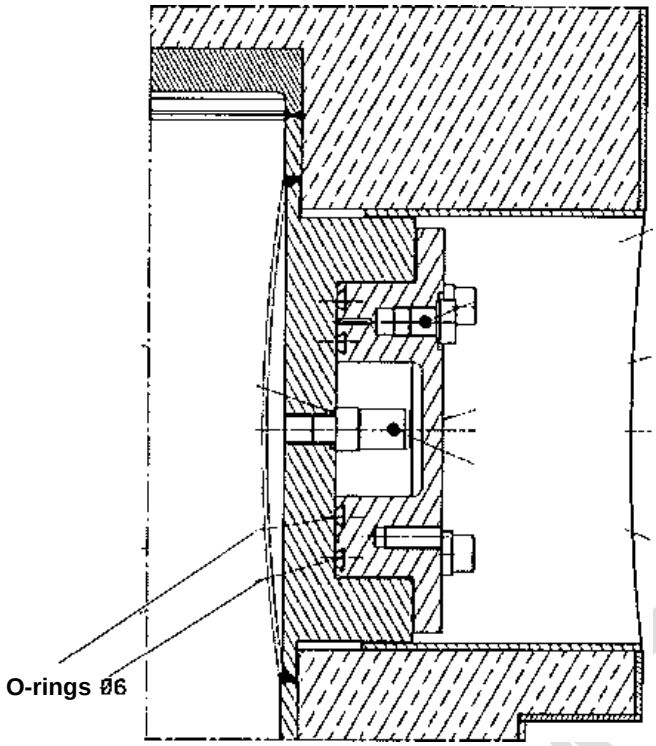


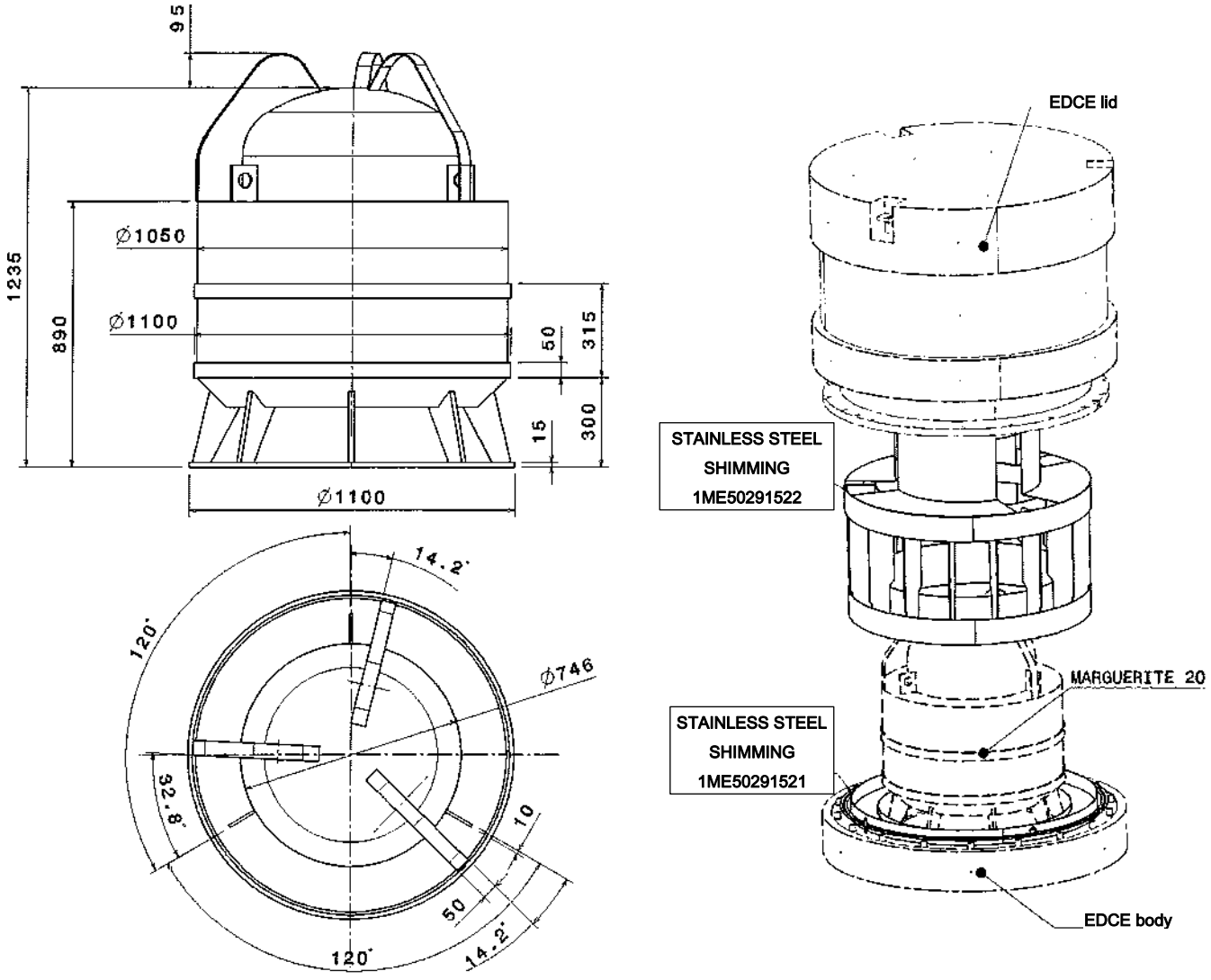

Detail D



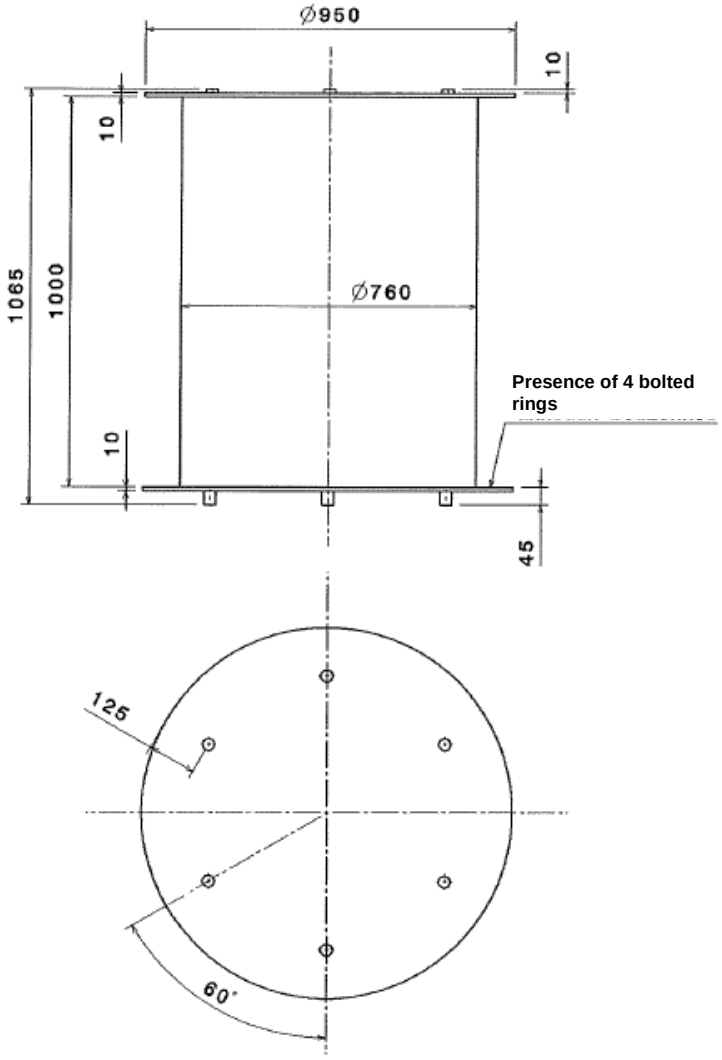

EDCE Closure

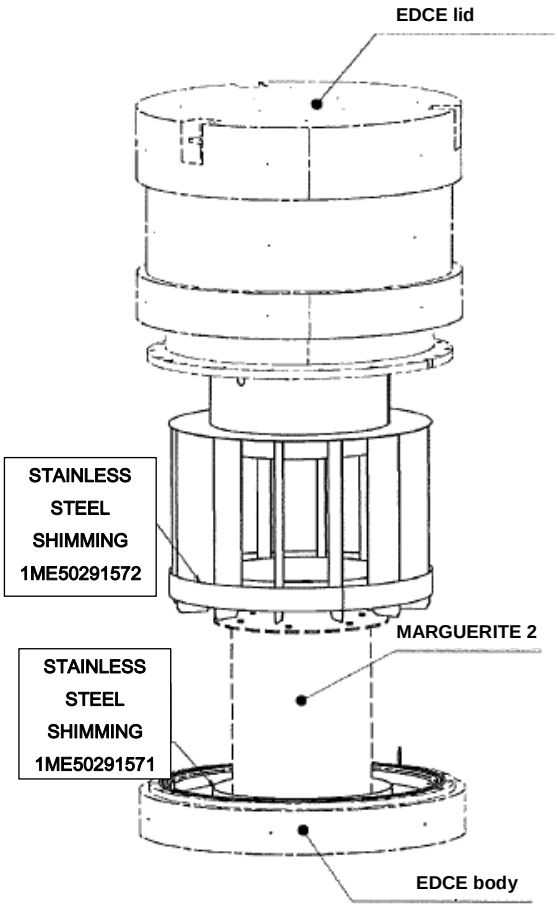


## FIGURE 3.3
## DIAGRAM OF THE MARGUERITE 20



## FIGURE 3.4
## DIAGRAM OF THE MARGUERITE 2



## FIGURE 3.5
## DIAGRAM OF THE GETER 2B

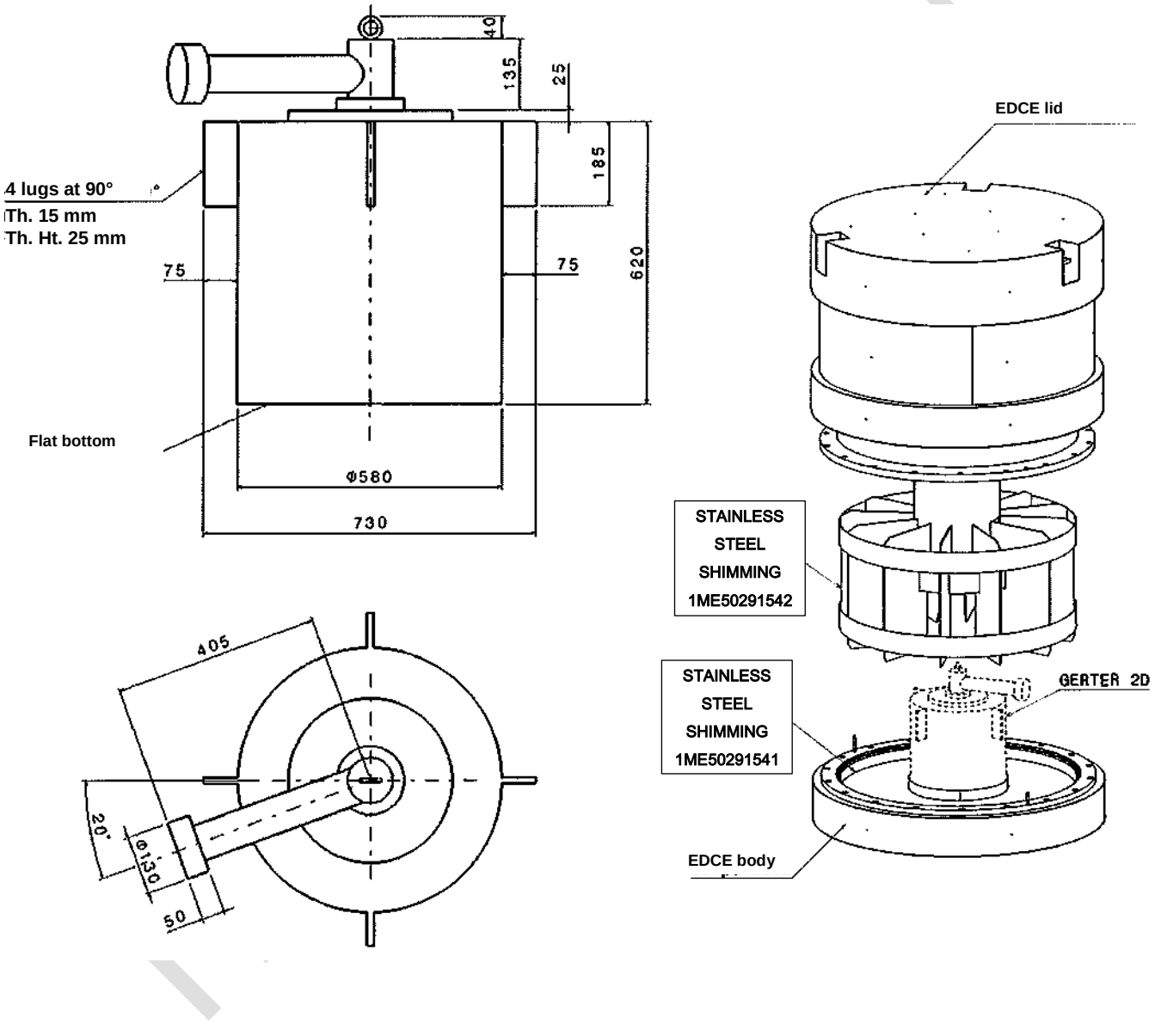


**FIGURE 3.6**
**DIAGRAM OF THE GSM 15**

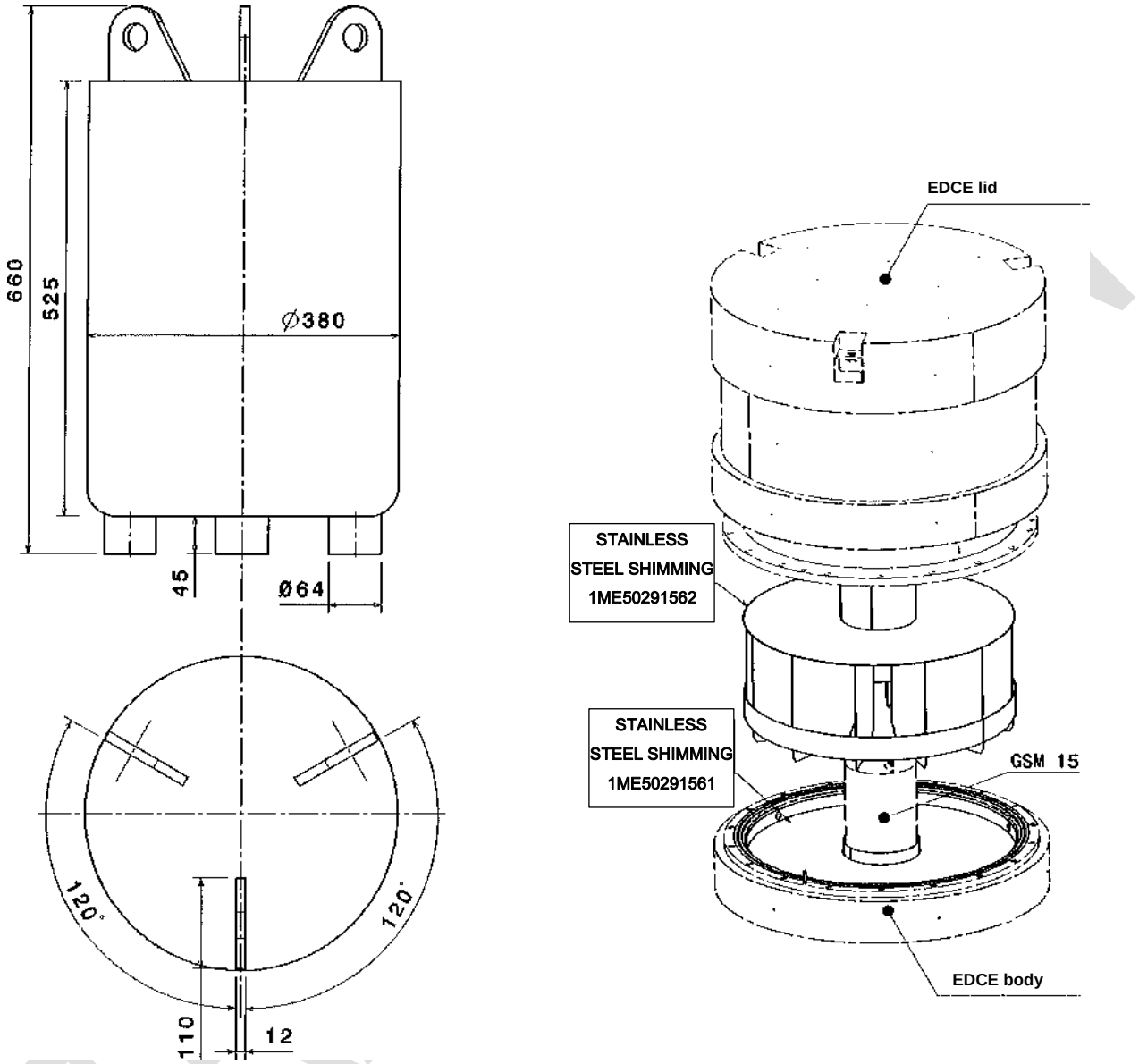
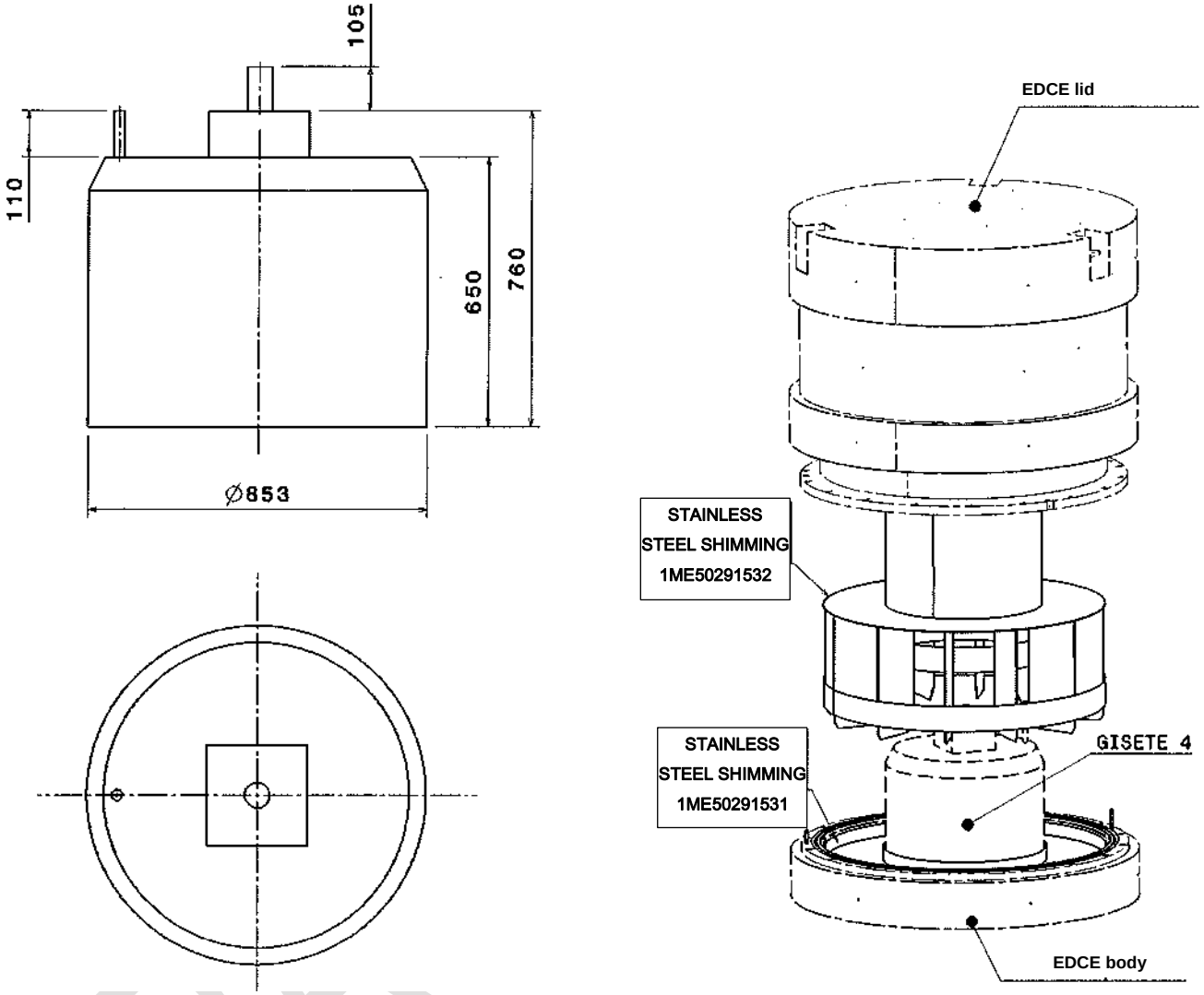
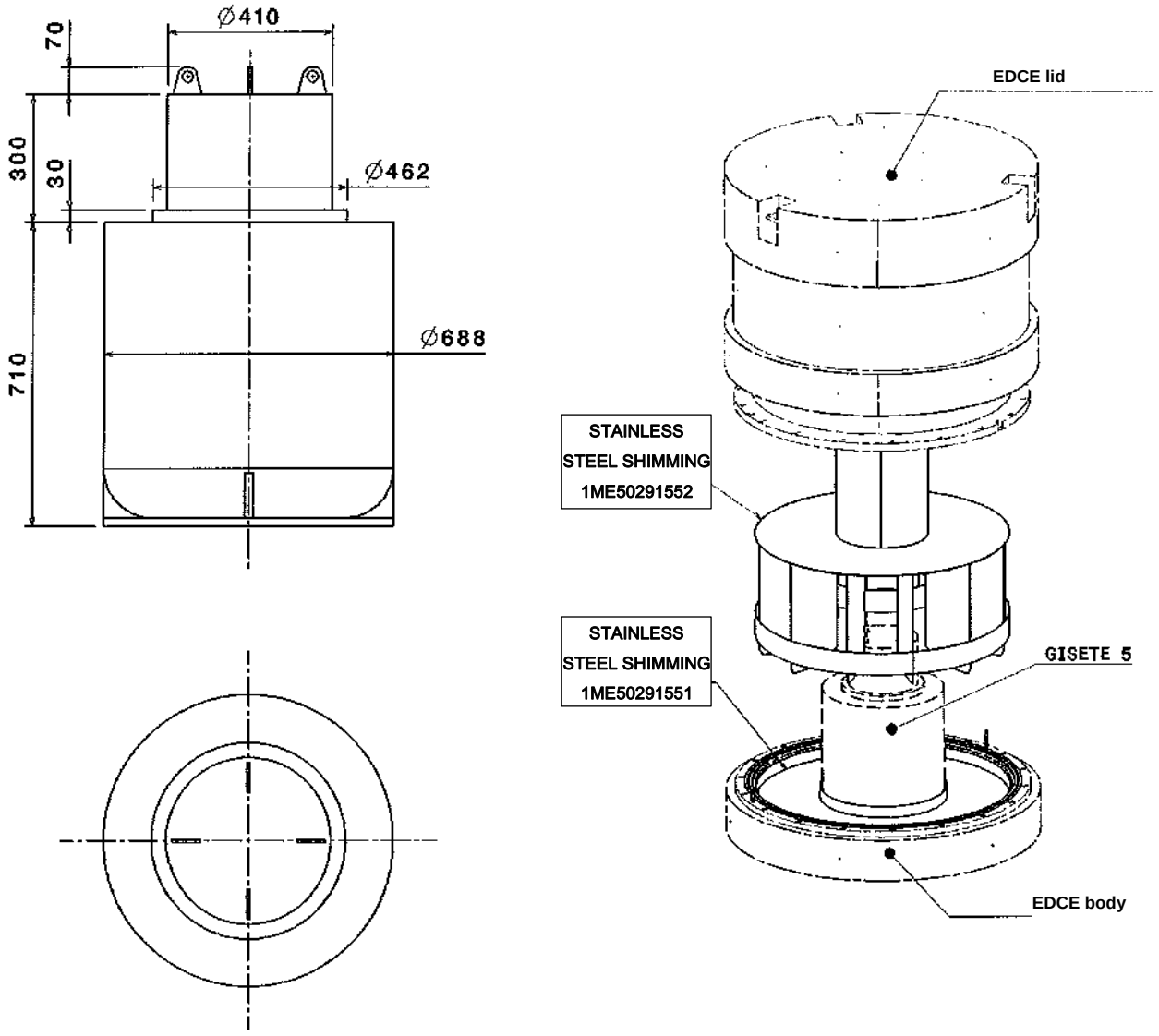


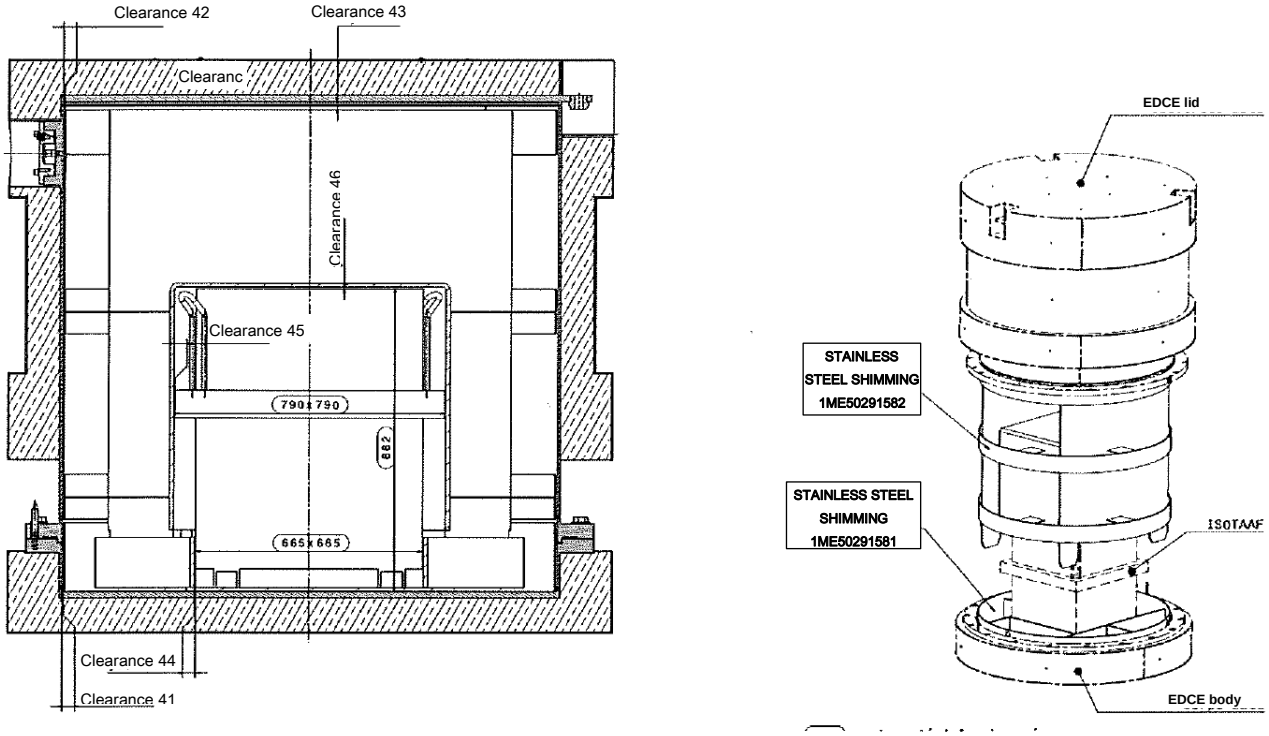
**FIGURE 3.7**
**DIAGRAM OF THE GISETE 4**



## FIGURE 3.8
## DRAWING OF THE GISETE 5 NON-REMOVABLE EQUIPMENT



## FIGURE 3.9
## DIAGRAM OF THE ISOTAAF 1



U.S. Department of
Transportation

**Pipeline and
Hazardous Materials
Safety Administration**

**East Building, PHH-23
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