
Information Paper

How to interpret the information
displayed on the CSC plate of an
ISO general purpose container

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Introduction

The World Nuclear Transport Institute (WNTI) is a Non-Government Organisation (NGO) that represents the radioactive materials transport industry, focusing on the needs of its members. One of the ways WNTI does this is via its Observer Status role at the International Atomic Energy Agency (IAEA). At the IAEA, WNTI actively participates in discussions on the content and meaning of the radioactive materials transport regulations, contributes to the development of IAEA Guidance documents, and helps develop IAEA Technical Reports. WNTI has Consultative status at the International Maritime Organisation (IMO) where it is the only NGO recognised as being an industry expert in radioactive material transports. The WNTI is also a Category A Liaison Organization to the International Organization for Standardization (ISO) delivering industry's opinions on various issues.

Whenever necessary, WNTI utilizes its extensive network of contacts to act on behalf of its membership to represent and advocate with the appropriate and applicable involved industry groups and regulators. WNTI endeavours to achieve resolution and suitable outcomes to various issues that affect those parties. The need for and subsequent development of this information sheet has resulted from one of those issues raised by its members.

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Scope

This information paper provides users responsible for the packing and securing of cargo within ISO general purpose containers and those whose task it is to train the people packing cargoes:

- (a) With the necessary advice to correctly understand and interpret the information displayed on the container CSC plate.
- (b) To calculate and deduce the maximum forces the container walls are able to withstand during 'routine conditions of transport'.

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References

CSC Convention: International Convention for Safe Containers, 1972, as amended (CSC)

CTU Code: IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (CTU Code) – 2014

ISO 1496-1: ISO 1496-1:2013 Series 1 freight containers – Specification and testing – Part 1: General cargo containers for general purposes

TIR Convention: Customs Convention on the International Transport of Goods under cover of TIR Carnets, 1975

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Definitions

CSC plate: safety approval plate required by the CSC Convention to be permanently affixed to the rear of the freight container, usually the left-hand door.

General cargo container: freight container that is not intended for use in air transport, nor primarily intended for the carriage of a particular category of cargo such as a cargo requiring temperature control, liquid or gas cargo, dry solids in bulk or cargoes such as automobiles (cars) or livestock.

General purpose container: general cargo container that is totally enclosed and weather-proof, having a rigid roof, rigid side walls, rigid end walls and a floor, having at least one of its end walls equipped with doors and intended to be suitable for the transport of cargo of the greatest possible variety.

ISO container: freight container complying with all relevant ISO container standards in existence at the time of its manufacture.

Routine conditions of transport: incident free transport, covering the everyday use and transport of the containers in which there are no minor mishaps or damaging incidents to the containers (incident free), those conditions are also named “general transport conditions” in the CTU Code (see Chapter 5 of the CTU Code).

Some definitions from Annex 1 of the General Provisions of the CSC:

‘g’ the letter g: means the standard acceleration of gravity; $g = 9.8\text{m/s}$ (metre per second).

Load: a physical quantity to which units may be ascribed, signifies mass.

Maximum operating gross mass, Rating or R: the maximum allowable sum of the mass of the container and its cargo. The letter R is expressed in units of mass. Where the annexes are based on gravitational forces derived from this value, that force, which is an inertial force is indicated as Rg .

Maximum permissible payload or P: the difference between the maximum operating gross mass or rating and the tare. The letter P is expressed in units of mass. Where the annexes are based on gravitational forces derived from this value, that force, which is an inertial force is indicated as Pg .

Tare: the mass of the empty container including permanent ancillary equipment.

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What is the purpose of the CSC plate?

The CSC plates fitted onto shipping containers display a large amount of important information designed to assist persons using or handling such units to clearly assess and establish the suitability and intention for which the container has been designed, approved for use, and that it is routinely recertified and maintained in a condition that will not create any obvious risk to safety.

Routine maintenance inspections and examination of containers

Annex 1. Regulation 2 of the CSC addresses responsibilities associated with the maintenance and examination of containers. There are two options being, the Periodic Examination Scheme (PES) and the Approved Continuous Examination Program (ACEP).

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The basic information displayed on CSC plates

At the time of initial production, container manufacturers are required to permanently affix to each container a CSC Safety Approval Plate containing information as listed below. The information is to be provided in at least the French or English language with the plate normally being bolted or riveted to the exterior surface of the container's left door.

Below is an explanation describing the information to be displayed on the CSC Safety Plate

1. Country of approval and reference number. The letters proceeding the slash or hyphen refer to the country code, followed by details relating to the applicable inspection criteria of the specific classification society and finally the approval year of that criteria. The layout and formatting of this information can vary from plate to plate.
2. Date, (month and year) of manufacture.
3. Manufacturer's identification number of the container. The unique ID number assigned by the classification agency to track container inspections.
4. Maximum operating gross mass (kg and lb). This is the maximum safe weight or mass of a container when fully loaded with its contents. It includes the tare weight of the empty container.
5. Allowable stacking load for 1.8g (kg and lb). Containers may experience G-forces greater than 1 when ships experience severe weather at sea. The number indicates how much weight can be safely stacked on top of a container even when the container experiences 1.8 Gs at sea.
6. Transverse racking test force (Newtons). The amount of force that can be applied to the top edge of the container before the frame warps.
7. End-wall strength to be indicated on plate only

CSC SAFETY APPROVAL	
1	[GB-L/749/2/7/75]
2	DATE MANUFACTURED
3	IDENTIFICATION No.
4	MAXIMUM OPERATING GROSS MASS kg lb
5	ALLOWABLE STACKING LOAD FOR 1.8g kg lb
6	TRANSVERSE RACKING TEST FORCE newtons
7
8
9

Figure 1 CSC Safety Approval model template layout

if the end-walls are designed to withstand a force of less or greater than 0.4 times the gravitational force by maximum permissible payload, (i.e.) 0.4Pg.

8. Side-wall strength to be indicated on plate only if the side-walls are designed to withstand a force of less or greater than 0.6 times the gravitational force by maximum permissible payload, (i.e.) 0.6Pg.
9. First maintenance examination date (month and year) for new containers and subsequent maintenance examination dates (month and year) if plate is used for this purpose.
10. One door off stacking strength to be indicated on plate only if the container is approved for one door operation. The marking shall show: ALLOWABLE STACKING LOAD ONE DOOR OFF FOR 1.8g (kg and lb). This marking shall be displayed immediately near the stacking test value (see line 5)
11. One door off racking strength to be indicated on plate only if the container is approved for one door operation. The marking shall show: ALLOWABLE STACKING LOAD ONE DOOR OFF FOR 1.8g (kg and lb). This marking shall be displayed immediately near the racking test value (see line 6)

The above information is reported on CSC certificates issued by the administration (generally a Classification society such as Lloyds Register (UK) or Bureau Veritas (France) generally on behalf of a national competent authority) being in charge of the approval of the containers. The inspection and certification must be undertaken before a new container is put into service.

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Additional information displayed on CSC plates

The code itself does not specify any defined or prescribed formal layout for how the information should be displayed or grouped within the CSC Plate. However, all plates have clearly defined areas allocated to addressing and providing relevant information as described in the safety approval model template.

In addition to the specific requirements listed in the CSC approval model template there are provisions within the CSC plate to display other relevant information effecting the overall serviceability and usage of the container. These include indicating the approach taken to address routine inspections and examinations, confirmation of any TIR and or TCT approvals as well as information relating to any approval for One Door Off Operation that would affect end and side wall stacking and racking weights and values. Some examples with explanations follow. The surface condition of these plates reflect the harsh conditions that CSC plates are exposed to during their time in service.



Fig 2 Example of a CSC plate all approvals

The Safety Approval section of CSC plates will display slightly different inspection information depending on the method chosen to undertake routine inspections and safety examination processes.

CSC plates for containers under the Periodic Examination Scheme (PES)

The CSC requires freight containers to be thoroughly examined 5 years after manufacture and subsequently at least every 30 months. The CSC plate for a container set up under the PES will include a section displaying details indicating its Next Examination Date (NED). The date of the NED is either stamped on the approval plate or affixed to it in the form of a decal.



Fig 3 CSC plate for a container operating under the PES.



Fig 3a Container end wall detail

The example above indicates the date of the next periodic inspection as being August 2022. Note: this CSC Plate is for a half height container currently being held in storage, out of service. The unit/s fitted with lids were used for transporting iron oxide which interestingly also explains the NO TIMBER COMPONENTS description, the flooring being steel.

CSC plates for containers under the Approved Continuous Examination Program (ACEP)

CSC plates for containers set up under ACEP do not have expiration dates, being covered by systems involving off-hire and on-hire inspections for containers operating under commercial lease arrangements and in-service inspections for containers being managed by shipping line operators. The CSC plates on containers covered by the ACEP program should include details indicating the ACEP designation, the country that granted the ACEP, the year such approval was granted, along with the ACEP registration number. Containers operated under an ACEP scheme must display the scheme number on the CSC plate, often in the form of a decal. Whilst the ACEP scheme is the more familiar practice, both schemes are intended to ensure that containers are maintained at the required level of safety and therefore may be considered as being equal.

CSC plate with the reference of the approved continuous examination programme (ACEP) of the owner or manager (in this example), the ACEP approval has been issued on behalf the UK competent authority with the reference ACEP GB/199. In this case (ACEP) it is the responsibility of the fleet manager or owner to proceed with examinations at intervals of not more than 30 months in compliance with the approval indicated on the CSC plate.

ACEP approvals are issued to container fleet owners or managers on the basis of a review by the administration of their organization and the means set up to perform the examinations as specified by the

CSC. Consequently, the mark of an ACEP approval on a CSC plate of a container is valid only when this container is owned or managed by the owner or fleet manager to which the approval has been issued by the administration, and when the periodic CSC examinations of this container are supervised by the entity to which the approval has been issued. In other words, the validity of the ACEP approval for a particular container ceases on the date of the removal of that container from the fleet of containers under the control of the entity to which the ACEP approval was issued (e.g. the container is either sold or leased to another entity). See § 12.4.4.3.2 of CSC.1/Circ.138/Rev.1 for detailed requirement.



Fig 4 A CSC plate operating under ACEP



Figure 4a A rare example of a container with three door locking mechanisms

The example on the opposite page shows a CSC plate for a container operating under the Approved Continuous Examination Program (ACEP). Interestingly the CSC plate is fitted to a rare example of a container built in 2018 fitted with three door locking assemblies. Such units are uncommon with operators preferring not to utilise them due to the reduced load bearing capacity afforded by the single door locking mechanism.

A container should not be used for intermodal or international transport if there is no ACEP marking, if the Next Examination Date has elapsed, or if the NED is before the expected arrival time of the container at its destination. (CTU Code Annex 4 1.2.3)

TIR Approval for Transport Under Customs Seal.

The Transports Internationaux Routiers [International Road Transport] (TIR) Convention is an international harmonized Customs transit system currently operational across sixty (60) countries worldwide, facilitating trade and transport whilst effectively protecting the revenue of each country through which the goods are carried. It is structured to allow for the carriage of goods in sealed road transport vehicles, combinations of vehicles, or in containers from the country of origin through to the country of final destination which as a general rule shall not be subjected to Customs examination and inspections at country borders nor the requirement to deposit a financial Customs guarantee at each country border.



Fig 5 Information on the CSC plate addressing TIR approval

The TIR system, delivers a balance of efficient and secure international transit security and facilitation, through the implementation of harmonized border crossing procedures, contributing to improving the global supply chain by avoiding wasting precious resources at border crossings. In order for containers to be able to transport goods under custom seal they need to satisfy TIR requirements.

<https://www.iru.org/tir>

ISO-1496 3 states that containers approved for transport under Customs seal shall, in addition, bear the following details which shall also be put on the CSC safety approval plate in accordance with the provisions of Annex 5: (a) the manufacturer's serial number (manufacturer's number) and (b) if they have been approved by design type, the identification numbers or letters of the type.

Timber Component Treatment. TCT Approval

Containers fitted with exposed timber (wooden flooring) must be permanently treated to minimise biosecurity impediments to flora and fauna. Such treatments can be applied and approved during the construction and or ongoing subsequent maintenance of the container so as to prevent infestation of the timber components during the service life of the flooring whilst many treatments will also provide protection against timber decay.

This approval confirms that the timber (wooden flooring) of the container has been chemically treated to prevent infestation a very handy option to address quarantine inspection issues.

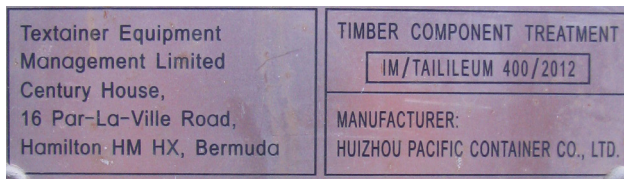


Fig 6 CSC plate addressing TCT approval

The example above follows on from Fig 5, this approval confirms that the timber (wooden flooring) of the container has been chemically treated to prevent infestation a very handy option to address quarantine inspection issues.

“One Door Off” or “One Door Off Operation”

Under certain conditions containers may be allowed to operate in one door off mode. In these cases, the container will have reduced capacities for stacking load and racking force. This is due to the fact that when the doors are open or ajar those strengths are lost creating the opportunity to create overstressing of other container componentry resulting in the possibility for damage and permanent distortion to occur.

For example, cargoes such as onions that require additional ventilation are often carried in containers that have their doors either secured partly open, or removed.

Regulation 1,3 of the CSC Convention states that “Where the stacking or racking values are less than 192,000kg or 150kN, respectively, the container shall be considered as having limited stacking or racking capacity and shall be conspicuously marked, as required under the relevant standards. In such an instance those values should be indicated in the bottom section of the main safety approval plate as detailed within Fig 1 and explanatory notes, 7 and 8 described within the information shown below the CSC Safety Approval model template layout. Interestingly there are no details displayed on the CSC Safety Plate indicating the tare of the container.

The stacking, racking, end and side wall strength load values the container can withstand when it is being used in one door off mode shall be displayed at the bottom of the CSC plate with the information “ONE DOOR OFF” or “ONE DOOR OFF OPERATION”.

The CTU Code at 8.2.1.5 suggests that the practice of transporting cargo in one door open or one door removed freight containers is inherently dangerous and therefore is strongly discouraged. The practice is illegal unless it is marked (displayed) on the CSC plate (refer fig 7).

Additionally, there may be negative consequences to using this practice throughout the supply chain (e.g.) terminals may refuse to handle or accept “open door” freight containers. This is due to the fact that containers being operated with doors open or ajar may cause interference with vessel lashing systems and also may cause problems or sustain damage when being handled by straddle carriers or other terminal and or associated customer handling equipment. Containers that have their doors secured partly open or removed, must only be handled by equipment that applies a direct vertical force to the container corner fittings.

The WNTI does not condone the use or adoption of the one door open or one door off operation when transporting any form of radioactive cargo. Such a practice could severely compromise the strength of the securing system for the packages in the sea container as well as raise a number of basic security concerns.



Fig 7 CSC safety approval plate for one door off operation



Fig 7a Container door information

Figure 7 covers a One Door-Off approval. Here the CSC Plate displays the original allowable stacking weight, racking load values, together with those values adjusted for when the container is being operated in 'One Door-Off' mode.

The CSC Plate example indicates a side wall strength for doors closed but does not display a value for the original end wall strength with the container doors closed. However, we can calculate that value, recalling that the maximum permissible payload or P is the difference between the maximum operating gross mass, rating or R and the tare of the container. The allowable end wall strength can then be determined by multiplying P by 0.4. By way of confirmation

MAXIMUM OPERATING GROSS MASS, RATING OR R	TARE OF THE CONTAINER	MAXIMUM PERMISSIBLE PAYLOAD OR P	SIDE WALL STRENGTH 0.6 P (DOORS CLOSED)	END WALL STRENGTH 0.4 P (DOORS CLOSED)
32,500 kg	2,350 kg	30,150 kg	17,487 kg	12,060 kg

We can then simply transpose that value and the other values from the CSC Plate

TEST	DOORS CLOSED	ONE DOOR-OFF	REDUCTION %
Stacking Weight	216,000 kg	60,960 kg	71.8 %
Racking Load	15,240 kg	7,500 kg	50.8 %
Door Wall Strength	12,060 kg	5,650 kg	53.2 %

ATTENTION: these lesser values shall not apply when the container is being operated with all of its doors closed (in that case, the 0.4 Pg would still be valid with the maximum permissible payload for end wall strength when both doors are closed).

When there is no reference to "One Door Operation" displayed on the CSC plate, the end walls are able to withstand a force $F = 0.4 \times P \times g$, in which "F" is the force in N, "P" is the maximum permissible payload in kg (maximum gross mass less the tare), "g" is the gravity ($9.81 \text{ m}^2.\text{s}^{-1}$), and the side walls are able to withstand a force $F = 0.6 \times P \times g$. These forces are considered as being static forces uniformly distributed on the walls and are only applicable when the container is being operated with its doors closed.

Appendix 1

Additional Information on References

The CSC (Convention for Safe Containers)

The International Convention for Safe Containers (CSC), is an international agreement dating to the 1972 to help promote safety in the shipping industry by standardising factors such as strength requirements and testing procedures. It incorporates design requirements, minimum functionality requirements, measurements of capacity, weight, and resistance to the forces that cargo containers may be subjected to when shipping containers are transported by sea within ships, or by trains or trucks on land.

The goal of the CSC is to formalize the safety requirements by setting international standards addressing structural design-type approvals and consistent safety inspection and maintenance regimes so that the transportation of containers functions globally under one set of safety regulations helping to keep workers as kept as safe as possible.

The IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (CTU Code)

The function of the CTU Code is to assist the industry, employers' and workers' organizations as well as Governments in ensuring the safe stowage of cargo in general cargo containers. The code contains comprehensive information referencing all aspects of loading and securing of cargo in cargo containers and other intermodal transport are provided, taking account of the requirements of all.

The CTU Code applies to transport operations throughout the entire intermodal transport chain, covering sea and land transport modes providing guidance not only to those responsible for packing

and securing cargo including dangerous goods, those whose task it is to train the people packing such cargo as well as those who receive and unpack such cargo.

The 2013 ISO 1496-1 series 1 sixth edition

This ISO publication contains fully detailed information covering requirements regarding design, specifications and testing procedures of all componentry relating to the construction and maintenance of containers, (including stacking, racking, end and side walls).

The TIR Convention approval for Transport under Customs Seal

The TIR is a European initiative that began in 1949, initially covering road and rail transport. It allows for and promotes the facilitation of procedures that encompass fast and efficient international and cross border transport of cargo allowing for cooperation between customs administrations. Universally accepted, its' coverage extends to include multi-modal shipping containers.



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