

Possible consequences of a new European container standard (EILU)

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Preface

This is a master thesis in Shipping and Logistics at the School of Maritime Studies, Chalmers Lindholmen University College. We got the opportunity to highlight possible consequences of a new European container standard (EILU). By our study we assist the Short Sea Promotion Centre, Sweden (Sjöfartsforum) in their work to give feedback on the development of new modern loading units.

We would like to thank all people who have cooperated with us and contributed with facts and opinions on the subject. Especially we would like to thank our supervisors Prof. Kenth Lumsden and Per Jessing for showing great interest and support. We would also like to thank our programme director Göran Johansson and our lecturer in methodology and logistics Stefan Pernzelius for their energetic inspiration.

The proposal of a European Intermodal Loading Unit is an ongoing process within the EU and the CEN. We hope that this master thesis will contribute to the process.

Göteborg, September 2004.

Frederik Hallbjörner

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Executive Summary

The purpose of this master thesis is to highlight possible consequences for shipping caused by a new European container standard (EILU¹) according to the proposal for a directive of the European Parliament and the Council on Intermodal Loading Units, Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), in this report called the EILU-proposal.

The EILU-proposal deals with two main areas. On the one side the periodic inspections and CE marking of ILUs and on the other side the definition of the EILU-standard, combining the benefits of containers (their solidity and stackability) and of swap-bodies (in particular their greater capacity). It is the latter subject, the EILU definition, which we are studying. This in order to find possible technical consequences onboard the ships when the EILU-proposal is implemented and its effect on the shipping cost in European short sea shipping.

In order to get a clear identification of our problem we started our work with a pilot study. We asked nine open questions to four categories of actors in short sea shipping. The result of this pilot study was:

- The EILU-proposal is unsatisfactorily communicated within the shipping industry.
- An EILU is judged to be an intra-EU tool and not able to operate globally.
- Creating one more standard may cause operational problems and costs.
- The calculated potential of an EILU-standard is doubted and requires further analysis.
- Pallet-wide containers have been on the arena for about 20 years.
- The 45ft container is developed and about to be included in the ISO standard.
- The 45ft pallet-wide high cube is slightly bigger than the proposed long EILU.
- Ships design and operational reality is based on the multiple of 20/40ft, which is stackable and possible to combine in the same tier and hold. The 45ft container has its limitations, often put on deck in special positions.
- Large units and pallet-wide units are needed for many types of goods, but not all.
- Semi-trailers are known as efficient intermodal loading units, but excluded from the EILU-proposal.
- Feeder operators need to combine global and intra-EU flows of containers onboard the same ship in different combinations. They claim the need of conformity to the ISO standard.
- The design of ships and loading units must go hand in hand, both in time and technology, and have a core idea in dimensions, operability and functions.

We found the prevailing 45ft pallet-wide high cube container to be very similar to the proposed long EILU. We also found a diversity of perspectives leading to a discrepancy in understanding what is good to shipping and what the key facilities in order to improve intermodality are. We raise the question of perspective. The facilities of the 45ft PWHC gave us information on

¹ European Intermodal Loading Unit (EILU)

important functions to shipping, both LoLo and RoRo. Twelve bottom fittings make the unit able to comply with both RoRo and LoLo.

Looking deeper for consequences we made case studies and models. The general case criterion was an import/export transport where the sea leg would be an alternative to other modes, using a 45ft pallet-wide high cube container. The findings were:

- An EILU may only be profitable to shipping if it is rarely used and then as a complement to the ISO-containers.
- The EILU-proposal is not fully specified to foresee all consequences.
- The EILU-proposal leaves cargo hold design and ship operations criteria unspecified.
- The 45ft pallet-wide container does the same job as the long EILU.
- The function of the short EILU is not found logical to ship operators.
- A win-win situation for both shippers and operators must be created.

The EILU as a complement only

Due to the fact that the EILU only may be working in certain positions onboard, i.e. on deck where the overhang doesn't intrude upon other positions, makes it profitable for the ship operator up to a certain mix. This is strictly depending on the space available around the container positions. As soon as we lose one position, the benefit is lost on a fully booked ship. This is what we define as an "unclean" solution, meaning that the standard itself, without combination with the old ones, cannot create increased utility and lowered costs.

Full specification of the EILU

Taking the above findings into account it is obvious that the details of importance to shipping is not defined. Such details are the exact external dimensions and the number and positions of the corner fittings. In our study we have assumed that the EILU has to follow the recommendations in the UTI-Norm report, leaving overhang symmetrically fore and aft.² This overhang is calculated to be 0.7m each end. This makes operational difference between the 45ft container and the EILU.

The situation is the same regarding the width. Due to the presence of the pallet-wide (2.5m) containers, many ship designs are adjusted, so the transverse distance between the twistlocks (in non cellular areas) allows such overhang. If the EILU goes further to 2.55m there will be further restrictions to the EILU, still looking from a "today" perspective. We have assumed the width of 2.50m in our case studies, to make it similar to the pallet-wide containers.

Cargo hold design and ship operation criteria

As the EILU-proposal does not fully specify details needed for shipping, the proposal cannot result in recommendations of cargo hold design or ship operation criteria. We find it crucial to take these into account and so make it possible to formulate guidelines to the ship design industry. Such guidelines should include:

² Ref. page 19.

- Minimum transversal space between container fittings
- Minimum longitudinal space between container fittings
- Point loads as a function of stacking height available
- Procedures for handling and securing of containers, including twistlocks and rods, enabling efficient cargo planning with minimum restrictions

However we doubt that the best way to go is via CEN. We would prefer to work closely with ISO, with the “next generation” perspective. For example: Space less than 0.7m gives a worse case situation, not giving the EILU any potential of increased utility of the vessel.

Using the short EILU the findings are similar, but with the difference that the short EILU always will ask for a 40ft space and is not combinable with any other units than the 20ft ISO container. The short EILU cannot even be combined with the long EILU, the one of its own family.

A win-win situation for both shippers and operators

The last big and vital finding is the way of implementation. The EILU-proposal leaves the task to the actors to “discover its benefits”.³ From our case studies we learn that the price per ton or per pallet is the ruling factor for shippers, while the ship operators must gain operational benefits in time and utilisation of the vessel.

Our conclusions are that possible consequences of an EILU will be:

- **Another intermodal loading unit** will cause further restrictions for operators to consider, offering a choice beside swap-bodies, semi-trailers, ISO-containers and pallet-wide versions of the ISO-container
- The EILU together with other similar units generates a **win-win situation to some shippers and operators**, but only in case it is a complement to the ISO standard, and in case the overhang outside the fittings doesn’t intrude upon other positions onboard.
- **Possible segregation between global and intra-EU flows**. A risk of increased flows of empty units, as ISO containers will be rotating inside EU as well. The grey box concept⁴ idea is then moving backwards.
- A risk of **EU moving in its own direction** of the intermodal development, creating barriers and complication to the global work within the ISO.
- A risk of **increased costs for ship operators** as the EILU might cause lost space onboard.
- **Future vessel design** to consider the mix of loading units and extra space needed for EILUs, in order to be optimised for maximum cargo intake.

³ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), “Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units” – Section 6.2, item 24.

⁴ The “grey box concept” is the name of the idea that all containers are standard boxes usable for all shippers and operators.

- The presence of **another standard to be considered in ship design**, besides the ISO standard, with a different operational principle and requiring different space between the fittings, makes the interpretation and knowledge vital.
- Preserving **manual stowage and securing** onboard (twistlocks etc), with loss in time and safety, unless the EILU will be developed towards the ISO containers.
- Another possible consequence of the proposal is that it does **not lead to any change**. The EILU standard might not be used.

Our recommendations are:

Present generation

Promote short sea shipping by supporting the pallet-wide version of the 20ft-, 40ft- and 45ft container. As a first step increase the road restrictions from 13.600m to 13.716m allowing the 45ft square front container within the EU. Adjusting the swap-body standard so the units can be stacked and top lifted, makes shipping (primarily RoRo) an alternative for those who use such units, however, this cannot be promoted as the main solution of intermodality.

Next generation

Make Europe the leading force towards globalisation and continue to work within the ISO. The ISO Series 2 to be considered as a “clean” solution to shipping, but is a huge step to take. It requires an extensive work with preparing guidelines for the design of ships and equipment.

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Abbreviations and terms

Abbreviation/Term	Explanation	Source
Cargo in containers	Cargo in containers <ul style="list-style-type: none"> · Palletised cargo in containers · LCL/part loads · Liquid bulk, food or non food in tank containers · Dry bulk, such as plastics in 30ft bulk containers 	www.shortsea.info
Cell guides	Container securing system consisting of corner guide angles fitted to hull structure. Neither manual work nor additional securing is needed. The alternative is securing by twistlocks.	Jadwiga Igielska ⁵
Cellular vessel	A container fitted vessel with cell guides in the holds.	Authors
Container	“Container” means a box to carry freight, strong enough for repeated use, stackable and fitted with devices for transfer between different modes of transport.	COM(2003) 155 – article 3
Container fitted vessel	Vessel equipped with fitting for securing containers, not necessarily equipped with cell guides, and reinforced structure for the point loads in the corner positions. Caution and clarification is needed when describing a vessel as “container fitted” or “cellular”.	Authors
C20	20 feet long ISO container, with designation ICC or 1C according to SS-ISO 668.	Authors
C40	40 feet long ISO container, with designation 1AAA, 1AA or 1A according to SS-ISO 668.	Authors

⁵ Igielska, Jadwiga (1997), **Container Carriers – Operational Aspects**, Göteborg, page 8

EILU	<p>“European Intermodal Loading Unit” means an intermodal loading unit constructed in accordance with the essential requirements set out in Annexes I and II, COM(2003) 155, and the requirements for interoperability.</p>	COM(2003) 155 – article 3
Europallet	<p>A standard pallet with dimensions of 1.2m x 0.8m.</p>	COM(2003) 155
Feeder services	<p>Feeder services versus intra European services Definition: <i>Feeder containers</i>: schedule of vessel follows the deep-sea carrier. <i>Intra European containers</i>: schedule according to market demand. However, both types of cargo are shipped quite often on the same vessels.</p> <p>Feeder traffic:</p> <ul style="list-style-type: none"> · Quay-quay operation · Customer is deep-sea carrier · Schedule follows deep-sea carrier · Vessel calls at deep-sea terminal · Limited customer base · Easy market entry · Intercontinental cargo · Character, shipping activity, optimise use of vessel 	www.shortsea.info
FEU	<p>Forty Feet Equivalent Unit, see C40</p>	Authors
Harmonised standard	<p>“Harmonised standard” means a technical specification adopted by a recognised standardisation body on the basis of a mandate given by the Commission in accordance with the procedures laid down in Directive 98/34/EC for the purpose of establishing a European requirement with which compliance is not mandatory.</p>	COM(2003) 155 – article 3
ILU	<p>“Intermodal Loading Unit” means either a container or a swap-body. <i>Note: The EILU-proposal COM(2003) 155 has excluded the semi-trailer from the ILU term.</i></p>	COM(2003) 155 – article 3

ISO container	Freight container complying with all relevant ISO container standards in existence at the time of its manufacture.	SS-ISO 668 ⁶
Pallet-wide container	A freight container based on the ISO container dimensions but with an extended width, internally 2.42-2.44m and externally up to 2.50m.	Authors
PWHC	“Pallet-wide High Cube” – A pallet-wide container with external height of 2.90m.	Authors
Short sea shipping	”Short sea shipping” means the movement of cargo and passengers by sea between ports situated in geographical Europe or between those ports and ports situated in non European countries having a coastline on the enclosed seas bordering Europe. Short sea shipping includes domestic and international maritime transport, including feeder services, along the coast to and from the islands, rivers and lakes.	www.shortsea.info
Swap-body	“Swap-body” means a freight-carrying unit, used in Europe, optimised to road vehicle dimensions and fitted with handling devices for transfer between modes, usually road/rail.	COM(2003) 155 – article 3
TEU	Twenty Feet Equivalent Unit, see C20	Authors
UK pallet	A standard pallet with dimensions of 1.2m x 1.0m.	COM(2003) 155

⁶ Swedish Standards Institution SS-ISO 668, 1996,

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1 Introduction

This chapter introduces the reader to the programme for Promotion of Short Sea Shipping, of which the EILU-proposal⁷ is one of 14 individual actions. We also present the Swedish Maritime Forum which is the Swedish Short Sea Promotion Centre, located in Göteborg, Sweden.

This master thesis searches for possible consequences caused by the proposal of a new European container standard, as described in the document "Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units", Brussels, 2003-04-07, COM(2003) 133 final, 2003/0056 (COD), from here on called "the EILU-proposal". We start from the main principles of container transports and the benefit from global standardisation, which revolutionised the shipment of general cargo. The ISO standard container was the starting point for making a concept for the cargo handling techniques and the ship design of cargo holds, which still is in force and has decreased shipping costs and transit times tremendously.

The ISO-standard may be seen as a frame of which we may load different kind of cargoes inside. Beside reefer cargoes, dry and liquid bulk cargoes, steel and forest products, the majority of containers are designed as boxes used for transporting general cargo. A lot of such general cargoes are products for the daily market. The sizes of daily products are often in multiples of 0.6m, making the internal dimensions of the ISO-container not optimal.⁸ In Europe standard pallets often are used for such products. Therefore alternatives to the ISO standard container have been developed with an internal width exceeding 2.4m, resulting in better utilisation when standard pallets are stowed inside.

One variation of the ISO container is the pallet-wide container with an external width of 2.5m. Another pallet-wide box is the Swap-body, optimised for road traffic. The Swap-body is a European standard. Common for all variations of the ISO container (Swap-bodies included) is the position of the corner fittings, used for stowage and securing. One problem with the Swap-body is that it has no corner fittings on the roof, which is needed for stacking and lifting onboard LoLo vessels. The EILU-proposal was therefore introduced and some people were attracted by the vision of having modern containers designed for modern dimensions and smooth intermodal solutions.

As the EILU-proposal should promote shipping, we have concentrated our study to consequences onboard ships. The study consists of a pilot study, asking nine open questions to four categories of actors in shipping, and three case studies, where we followed 45ft pallet-wide containers on their voyages. Driven by the question if the EILU-standard is going to be of great importance to short sea shipping, we look for possible consequences.

⁷ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), "Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units"

⁸ Commission Press Room (2003), **European Commission promotes Short Sea Shipping and new intermodal equipment to fight congestion**, Brussels, 2003-04-10

1.1 Background

The EILU-proposal was built from the UTI-NORM research⁹, wholly funded by the Commission, under the European RTD programme and under the 4th Framework programme. This report set out future needs with regard to the standardisation of intermodal loading units and was presented 1999-09-28. It announced: “The current ISO containers, as standardised in ISO 668 and 1496, do not fit into the need of European logistics”. The current swap-bodies as standardised by CEN are optimised for road and rail transport only. They do not offer economic solutions for inland waterways or short sea transport. These two facts lead to the conclusion to create a European loading unit.

In the same year, 1999, the Commission presented a Communication with a comprehensive approach to increase the use of short sea shipping¹⁰. In February 2000 the Council Resolution on the promotion of short sea shipping was published and in 2001, the Commission’s White Paper on European transport policy for the year of 2010¹¹ emphasised the role of short sea shipping in maintaining an efficient transport system in Europe¹².

The EILU-proposal is based on Articles 71 and 80 of the Treaty, and is one of 14 individual actions, subdivided into measures presented in the Communication from the Commission “Programme for the Promotion of Short Sea Shipping”, COM(2003) 155 Final. The Commission has a target to ensure competitiveness and sustainability of mobility also in the year of 2010, and points out Short Sea Shipping as an obvious choice to play a key role in reaching these targets. Short Sea Shipping “can help curb the 50% increase in heavy goods vehicle traffic forecasted in the Paper¹³. It can help to rebalance the modal split, bypass land bottlenecks, and it is safe and sustainable.”¹⁴

Short sea shipping is proven to be highly successful and is the only mode able to keep up with the growth of road transport, and has increased by 38% in the 1990’s. Figure 1.1 is brought from the COM(2003) 155 Final and illustrates the statistics behind this statement.

⁹ UTI-Norm (1999), “**Current State of Standardisation and Future Standardisation Needs for Intermodal Loading Units in Europe**”, Contract no JC-98-RS.5039, page 9

¹⁰ Brussels, 1999-06-29, COM(1999) 317 final, “**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS, The Development of Short Sea Shipping in Europe: A Dynamic Alternative in a Sustainable Transport Chain, Second Two-yearly Progress Report**”

¹¹ COM(2001) 370, 2001-09-12

¹² http://europa.eu.int/comm/transport/maritime/sss/index_en.htm (acc 2004-06-22)

¹³ COM(2001) 370, 2001-09-12

¹⁴ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), “**COMMUNICATION FROM THE COMMISSION – Programme for the Promotion of Short Sea Shipping.**”, page 2

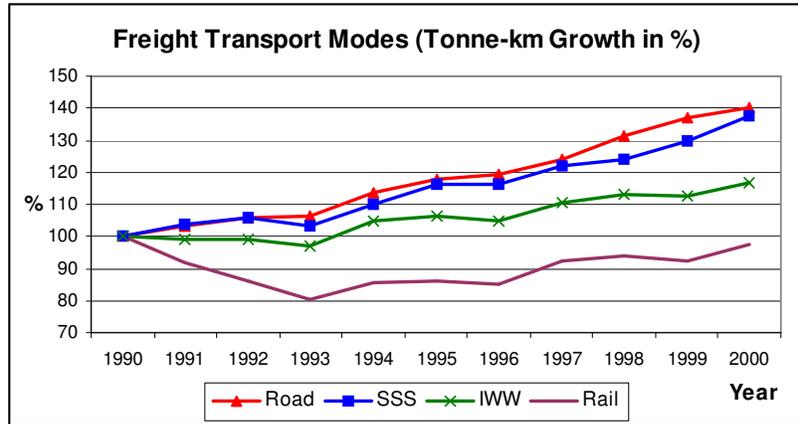


Figure 1.1) Tonne-kilometre growth 1990-2000 in percent in road, Short sea shipping, inland waterways and rail.¹⁵

In order to get the best out of Short sea shipping the Commission believes that a promotion programme is necessary¹⁶. Therefore 14 individual actions are nominated. The actions can be divided into *legislative*, *technical* and *operational* actions as follows:

A. Legislative Actions

1. Implementation of the Directive on certain reporting formalities for ships to arrive in and/or depart from ports in the Member States (IMO-FAL),
2. Implementation of the Marco Polo¹⁷,
3. Standardisation and harmonisation of intermodal loading units,
4. Motorways of the Sea,
5. Improving the environmental performance of Short Sea Shipping.

B. Technical Actions

6. Guide to Customs Procedures for Short Sea Shipping.
7. Identification and elimination of obstacles in order to make Short Sea Shipping more successful,
8. Approximation of national applications and computerisation of Community Customs procedures,
9. Research and Technological Development.

C. Operational Actions

10. One-stop administrative shops,
11. Ensuring the vital role of Short Sea Shipping Focal Points¹⁸,
12. Ensuring good functioning of and guidance to Short Sea promotion Centres¹⁹,

¹⁵ Main source: EU Energy and Transport in Figures – Statistical Pocketbook 2002.

¹⁶ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), "COMMUNICATION FROM THE COMMISSION – Programme for the Promotion of Short Sea Shipping.", page 4

¹⁷ Marco Polo is the name of the programme for moving cargo from the roads to rail, Short Sea Shipping and Inland Navigation.

¹⁸ Short Sea Shipping Focal Points are representatives of national maritime administrations. They are responsible for Short Sea Shipping in their administrations. Source: COM(2003) 155 Final.

13. Promote the image of Short Sea Shipping as a successful transport alternative,
14. Collection of statistical information.

Each action has its own Action sheet with foreseen measures and their deadlines. Regarding the item 3, Standardisation and harmonisation of intermodal loading units, it only consists of one measure, namely to “adopt the proposal on interoperability of intermodal loading units and implement it as soon as possible.”²⁰ Responsible actors are the member states, parliament and industry with a deadline described as first stage by 2004, thereafter continuously.

From this action sheet we go to the EILU-proposal²¹, the proposal in focus of our study. During our work (2003-2004) the EU and CEN²² have continued the process. There have been some meetings and many companies and organisations have been involved and have contributed with their opinions on the proposal. One predominant meeting was held 2003-10-02, at CEN, Brussels, concluded in the report of open CEN Forum on Short Sea Shipping – Intermodal Loading Units (ILU)²³. Reports, papers and statements from this meeting and other material relevant to our main problem are included in our report.

The EILU-development is still an ongoing process. It is a challenging task to study possible consequences of a proposal under development and change. Most probably an impossible mission, but still very interesting. Considering the possible changes and amendments to the proposal, our study is directed to the general problem in finding a way of increasing transport capacity and utility. We would like to see our study as one of several reports and papers pushing the development in a proper and useful direction.

1.2 The Swedish Maritime Forum

As the EILU-proposal is one of 14 individual actions within the programme for the promotion of Short Sea Shipping we appreciate that the Short Sea Promotion Centre in Sweden is willing to follow our study project closely. The position as the Short Sea Promotion Centre in Sweden is held by the Swedish Maritime Forum²⁴, “Sjöfartsforum”, Göteborg, Sweden. Secretary General for this organisation is Mr Per Jessing, whom we met during the initial planning phase for our master thesis in June 2003. Mr Jessing is one of our two supervisors²⁵.

¹⁹ Short Sea Promotion Centres (SPCs) or, in other words, national Short Sea Shipping Promotion Bureaux are industry-driven, impartial bodies promoting Short Sea Shipping. Source: COM(2003) 155 Final.

²⁰ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), “COMMUNICATION FROM THE COMMISSION – Programme for the Promotion of Short Sea Shipping.”, page 9

²¹ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), “Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units”

²² European Committee for Standardization, CEN (www.cenorm.be)

²³ CEN (2003), “Report of open CEN Forum on Short Sea Shipping – Intermodal Loading Units (ILU)”, Brussels

²⁴ Sjöfartsforum – www.maritimeforum.se

²⁵ The other supervisor is Professor Kenth Lumsden, Chalmers University of Technology, supervising our study from an academic perspective on transportation and logistics.

The Swedish Maritime Forum, founded in 1996, is an independent non-profit organisation with members from ports, ship owners, brokers, shippers, the SMA²⁶, universities, banks and unions. “The major task of Maritime Forum is to disseminate knowledge of and generate interest in shipping as a means of transport and an industry as widely as possible. It is expected to do this by co-operating closely with all interested parties with special emphasis on issues where joint action is the key to success.”²⁷ Among the different tasks of Maritime Forum we find them to present facts, inform target groups and participate in the official debate. The Maritime Forum promotes, for example²⁸:

- Shipping to be developed integrated with the transport system and infrastructure in Sweden and Europe.
- Promote and secure transports friendly to the environment.
- Actors in the shipping segment of jointly developing and marketing their product to be an integrated part of the logistic chains which rule all kinds of transports.
- Stimulate research and development within shipping.

The Swedish Maritime Forum became Short Sea Promotion Centre in Sweden in the year of 2000, which together with all other promotion centres forms the European Short Sea Network (ESN). “The ESN is a co-operation between all national short sea promotion centres. ESN has no legal status, but is an agreement between the members. The main objective of the European Short sea Network (ESN) is to promote short sea in the broadest sense of the word on a European level.”²⁹ The ESN history started in 1997 when the first national short sea information bureau was founded in the Netherlands, followed by the Flanders region. These bureaus soon realised the need of a network, reflecting the crucial characteristics of short sea shipping. In December 2000 there were sufficient numbers of promotion centres to create the ESN.

Reading about the objectives and targets of the ESN we find the definition of “short sea” and categories of target groups. Of special interest to us is the objective to identify common problems, needs and bottlenecks described in the contacts with the users. The ESN has a special role in the programme for the promotion of short sea shipping, which is described on “Action Sheet 12” named “Ensuring good functioning of and guidance to Short Sea Promotion Centres”.³⁰ So, the ESN, is in itself one of the 14 individual actions within the promotion programme.

²⁶ the Swedish Maritime Administration (SMA) – “Sjöfartsverket” – www.sjofartsverket.se

²⁷ www.shortsea.info (acc: 2004-06-29)

²⁸ www.maritimeforum.se (acc: 2003-10-23)

²⁹ www.shortsea.info (acc: 2004-06-29)

³⁰ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), “COMMUNICATION FROM THE COMMISSION – Programme for the Promotion of Short Sea Shipping.”, page 18

1.3 The purpose

The purpose of this master thesis is to highlight possible consequences for shipping caused by a new European container standard (EILU³¹) according to the proposal for a directive of the European Parliament and the Council on Intermodal Loading Units, Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), in this report called the EILU-proposal.

³¹ European Intermodal Loading Unit (EILU)

2 Identification of problem

This chapter presents the subject and the problem. In this chapter we break down the main problem into part problems, communicate our delimitations, and define the data to be collected.

In order to come to a consensus about technical and economical terms we have to structure different concepts in the area of containerised shipments and operations. People from all kind of activities, e.g. shippers, terminals, ship owners, line operators, road and rail haulers, equipment suppliers, use a variety of words and expressions. Sometimes they use the same term but give it different meanings. Different perspectives give different views about what is important or not.

2.1 Theory

This chapter summarises the theory of containerised shipments in different modes and applications. The content is reduced to a minimum and only giving the chief points.

Standardisation

If a cargo unit passes several nodes and is carried by several different types of carriers, equipment for handling and stowage will be required. If all cargo units are different the situation would be impossible to manage. This is the reason of standardisation. Standardisation may be created in different ways. A standard might be established within a company, nation, continent or be a global standard.³²

Intermodalism

There are a number of intermodal combinations available to shippers. Intermodal movements combine the cost and service advantages of two or several modes in a single product movement. In the US the most common examples are trailer-on-flatcar (TOFC), or piggyback, container-on-flatcar (COFC), and roadrailers.³³ In order to manage intermodal transport an extensive knowledge in restrictions, costs and options is required. Therefore so called intermodal marketing companies (IMCs), or shippers' agents, specialize in providing piggyback services to shippers and thus important intermodal links between shippers and carriers. IMCs purchase large quantities of TOFC/COFC services at discount and resell them in smaller quantities, again the same idea as the original containerisation idea gathering numerous small quantities to create large scale benefits. The hub and spoke concept is dealing with the problem of how to offer frequent transport with low costs.³⁴

The theory of intermodal transport put co-operation and competition in focus. Sometimes the modes are working together, offering a joint solution, and sometimes the modes and carriers are competing against each other on the same market. The central mechanism of intermodal

³² Lumsden, Kenth (1998), **Logistikens grunder – teknisk logistik**, Studentlitteratur, Sverige – page 454

³³ Stock, James R. och Lambert, Douglas M. (2001), **Strategic Logistics Management**, 4th edition, McGraw-Hill, New York USA – page 328-333

³⁴ Lumsden, Kenth (1989), **Transportteknik**, Studentlitteratur, Sverige – page 229

transports is the standardised container. If all modes of transport construct their own container, the choice of intermodal loading unit would be difficult.³⁵ The intermodal loading unit must comply with the handling system at the terminals, and the design of carriers. There are two main techniques of handling, vertical and horizontal handling.³⁶

Containers

Containers are boxes that can be filled with cargo for transport. Containers can easily be transshipped from one modality to another. Containers used in shipping, are standardised by the International Standardisation Organisation (ISO). The most used containers have a length of 20 ft (TEU) or 40 ft (FEU), a width of 8 ft and a height of 8 ft or 8.5 ft. Also other dimensions occur, like the 45 ft container, the pallet-wide container (sometimes called the Bell container) with a width of 2.5 m and the high cube container with a height of 9.5 ft.³⁷ Many types of containers are developed, within the ISO frame, for carrying different types of commodities. Not only general cargo, light or heavy, but also liquids (in tank containers), bulk cargoes (in bulk containers), and cooled or frozen cargo (in reefer containers). Temperature controlled units are often to be plugged in to the vessels power supply system, and supervised accordingly. Some containers may be loaded with dangerous goods and have to be stowed and segregated according to the IMDG Code³⁸. This giving a huge fleet of different types of containers, all placed inside the ISO-frame.

Requirements and details of ISO-containers are specified in ISO 668. The cargo carrying capacity varies, but may generally be stated as 30 tons for a 40ft container and 27 tons for a 20ft container. This makes the 20ft container attractive for high density cargo (e.g. steel products), while the 40ft container attract volume cargo, as most consumables are. There are also other container standards. In the United States we find the US domestic containers³⁹ of 48ft and 53ft length, 2.6m wide and up to 2.9m high (same as ISO). In Europe we find the swap-body of different lengths up to 13.60m⁴⁰, 2.50m wide and 2.67m high⁴¹. The swap-body is optimised to fit European roads, is a light construction (no or restricted stackability) and mostly not possible to top lift (there are grabber arm lifting areas in the bottom structure). The swap-body is standing on legs while the road vehicle chassis is backed in under the body, guided by the bottom structure.

The development of new container sizes may be illustrated as in Figure 2.1 where we may find different solutions somewhere between the “normal unit” and the “maximal unit”. Using the same corner boxes the development results in “overhang” outside the original frame.⁴² Swap-bodies, pallet-wide containers and US Domestic containers are such containers with fittings as the “normal unit” leaving overhang outside the original frame. Moving further towards the

³⁵ Lumsden, Kenth (1998), **Logistikens grunder – teknisk logistik**, Studentlitteratur, Sverige – page 488

³⁶ Lumsden, Kenth (1998), **Logistikens grunder – teknisk logistik**, Studentlitteratur, Sverige – page 492

³⁷ Wijnolst, N and Wergeland, T (1997), **Shipping**, Delft University Press, Delft – page 73

³⁸ International Maritime Dangerous Goods Code

³⁹ UTI-Norm (1999), “**Current State of Standardisation and Future Standardisation Needs for Intermodal Loading Units in Europe**”, Contract no JC-98-RS.5039 – page 70-73

⁴⁰ Class A is 13.60m and Class C is 7.82m

⁴¹ According to European standard EN 452:1995

⁴² Lumsden, Kenth (1998), **Logistikens grunder – teknisk logistik**, Studentlitteratur, Sverige – page 474

“maximal unit” this overhang might be a problem to some carriers, why the proposition of a new ISO Series 2 container has been discussed, but still not implemented.

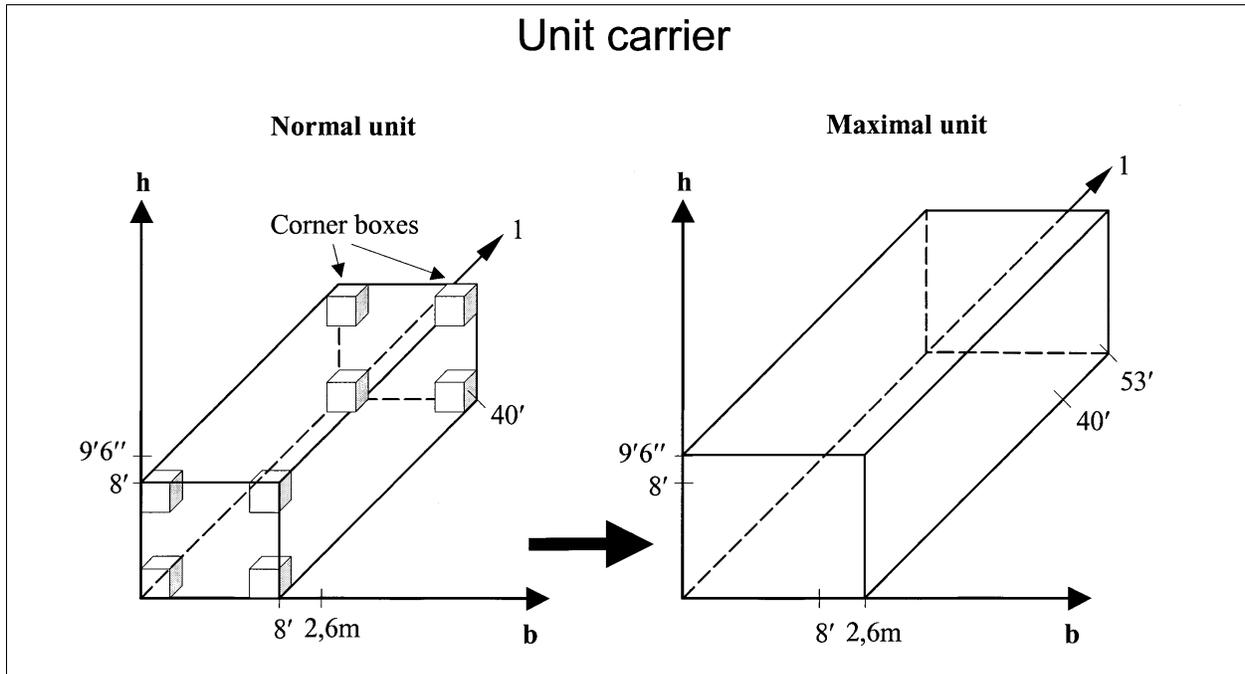


Figure 2.1) Maximal container dimensions, scenario. Source: Kenth Lumsden (1998)

Vessel types

Vessels used for containerised shipments may be divided into Lift On Lift Off (LoLo) vessels and Roll On Roll Off (RoRo) vessels. Both those types may be designed to carry containers or not⁴³. LoLo-vessels are loaded vertically by means of cranes⁴⁴. RoRo-vessels are loaded horizontally by means of terminal tractors⁴⁵. Different consequences occur for the two ship types. One should always make clear what type a certain question is referring to. Ports are often restricted in draft, beam and/or length. RoRo-vessels need a certain size to be efficient transport tools. This is because of the ability to drive and turn around on the cargo decks. In “small” ports we seldom see RoRo-vessels competitive. The RoRo-vessels are more competitive in combination with passengers, on short distances, and where trailers and other rolling cargo are transported. The LoLo-concept, in all sizes, is known as a cost efficient tool using containers. Both RoRo- and LoLo-vessels are used in short sea shipping. LoLo-ships in short sea services are mainly used because of restrictions in size and/or feeder connection to ocean going vessels.

⁴³ Wijnolst, N and Wergeland, T (1997), **Shipping**, Delft University Press, Delft – page 73-80

⁴⁴ Igielska, Jadwiga (1997), **Container Carriers – Operational Aspects**, Chalmers University of technology, Göteborg – page 4

⁴⁵ Igielska, Jadwiga (1999), **Roll-on/Roll-off Vessels – Operational Aspects**, Chalmers University of technology, Göteborg – page 4

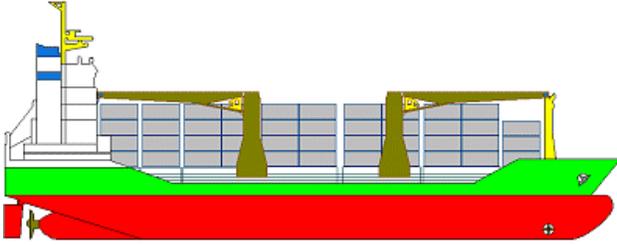


Figure 2.2) LoLo-vessel. Source: www.containerhandbuch.de (acc: 2004-06-30)

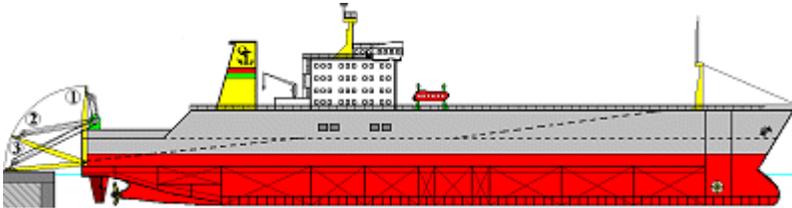


Figure 2.3) RoRo-vessel. Source: www.containerhandbuch.de (acc: 2004-06-30)

Cargo handling

Cargo handling is done differently depending on type of vessel:

LoLo: Intermodal loading units are loaded via container cranes with specially designed spreaders, automatically locking to the corner posts on the container. The containers are stacked on top of each other. Therefore the container must be able to be lifted “in the roof” and be strong enough to be stacked rather high. The LoLo-concept is very sensitive to varying dimensions of cargo units, mainly because of the means of securing, but also because the need of full stows of same type/size and possibility to segregate cargo for different destinations. In order to enable a multi-port rotation without shifting of cargo, the hatches often are arranged so they can be partly opened (often pontoon hatches).

RoRo: Intermodal loading units may be loaded on so called rolltrailers or cassettes (only used in the terminal) and stowed onboard, in the same way as other rolling cargo, or stowed onboard by a piggy back fork lift and secured by container fittings in the same way as onboard LoLo-vessels. For short sea shipping the roll trailer or cassette solution is the fastest and most efficient. An intermodal loading unit may also be carried on its road trailer all the way, but then classified as a trailer, and not a container. Where the deck height allows, the roll trailers may be double stacked, with two containers on top. The RoRo-concept is more flexible to varying dimensions of cargo units.

Stowage and securing

The key facility of the container is the corner fittings. These are used for lifting and securing. In all modes of transports and types of carriers the stowing and securing arrangement must meet these corner fittings in their exact position. This is the key of standardisation and interoperability. The positions are based on the ISO-standard for 20- and 40ft containers, where the corner fittings are put in the outer position in each corner. Containers with wider or longer dimensions have to

comply with these measurements, meaning that there will be protruding parts outside the frame made of the corner fittings⁴⁶. Depending on type of vessel the arrangements are different:

LoLo: There are two alternative ways of stowage and securing, either by using stacking cones/twistlocks between each corner fitting, or by stowing the container in cell guides⁴⁷. Using twistlocks the cargo hold may be more flexible to other types of cargo and units, but the stowage and securing need more manpower and consume more time. The distance between the container fittings and/or bulkheads rules the possibility of accommodating oversize units (other than 20ft and 40ft containers) using the same container fittings. Modern vessels also offer container fittings with 45ft distance. Using cell guides time and manpower needed for cargo handling is reduced dramatically. But on the other hand the cell guides are depending on the external dimensions of the container with strong enough corners.



Figure 2.4) Cargo hold with cell guides. Source: www.containerhandbuch.de (acc: 2004-06-30)

Removable and adjustable cell guides are available, enabling a variety of container types, but always giving an increased number of restrictions and re-arrangements⁴⁸. A combination of different length and width generates problem to the stowage planning and cargo handling operation. As the containers onboard *LoLo*-vessels are stowed vertically, stackability is a crucial facility of the container, with up to 9 or 10 fully loaded containers on top.

⁴⁶ Reference is made to ISO 668 (ISO-containers) towards the EN 452:995 (Swap-bodies), showing the corner fitting for a long swap-body having the same distance between the corner fitting as the 40ft container, i.e. longitudinally 11985mm and transversally 2259mm.

⁴⁷ Igielska, Jadwiga (1997), **Container Carriers – Operational Aspects**, Chalmers University of Technology, Göteborg – page 8

⁴⁸ Container Handbook, Section 1.3.2 (www.containerhandbuch.de), acc 2004-02-02

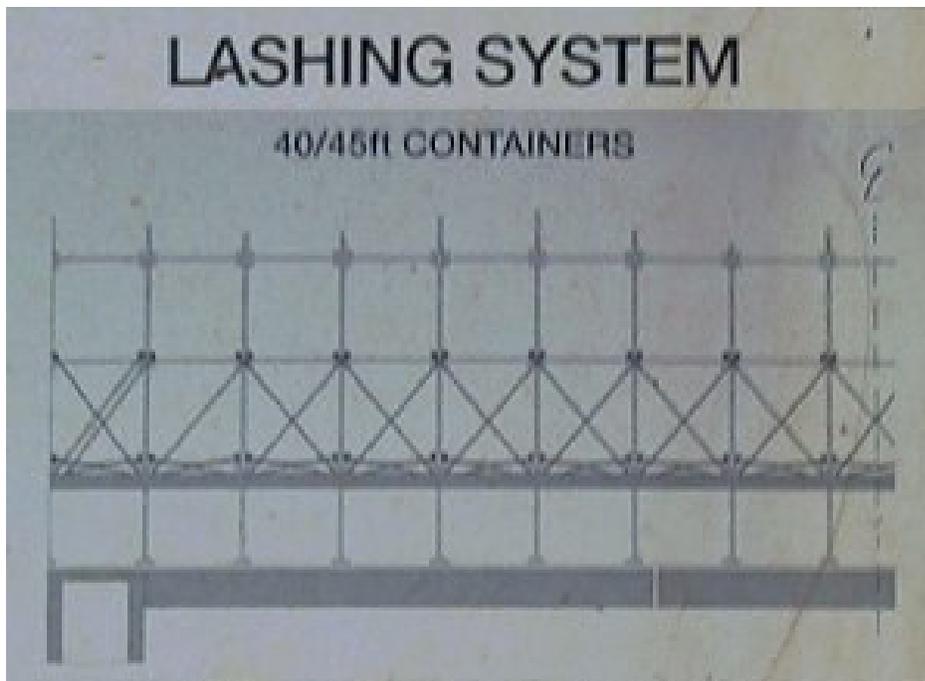


Figure 2.5) Lashing system on deck. Source: www.containerhandbuch.de (acc: 2004-06-30)

Most often the securing of cargo on deck is done with twistlocks. Stacking the containers three units high and more, the twistlocks must be complemented with rods, tightened by turnbuckles (see Figure 2.5) preventing the containers from “racking”. Practically this means that the corner fittings must be reachable for such an arrangement.⁴⁹

RoRo: Onboard RoRo vessels containers may be stowed directly on deck and secured with twistlocks, or put on rolltrailers/cassettes and stowed as rolling cargo. Rolltrailers and cassettes are most often of 40ft length, but may vary. The container is fixed to the rolltrailer/cassette via lockings to the corner fitting. The rolling cargo is stowed in lanes dimensioned for road vehicles of all kinds. If the deck height allows, containers may be stowed two units high on each rolltrailer. To move the rolltrailer or cassette, a terminal tractor is used. The rolltrailer is connected to the terminal tractor via a gooseneck, and the cassette is connected via a translifter. Both systems require reaching the front end of the rolltrailer or cassette, which mean that the oversize container must not extend over the front end, or corresponding length of the rolltrailer must be arranged.

Stackability of 45ft containers

The position and strength of the corner fittings are vital for the operability of the loading unit. This becomes obvious when it comes to the 45ft container as illustrated below.

⁴⁹ Igielska, Jadwiga (1997), **Container Carriers – Operational Aspects**, Chalmers University of technology, Göteborg – page 8

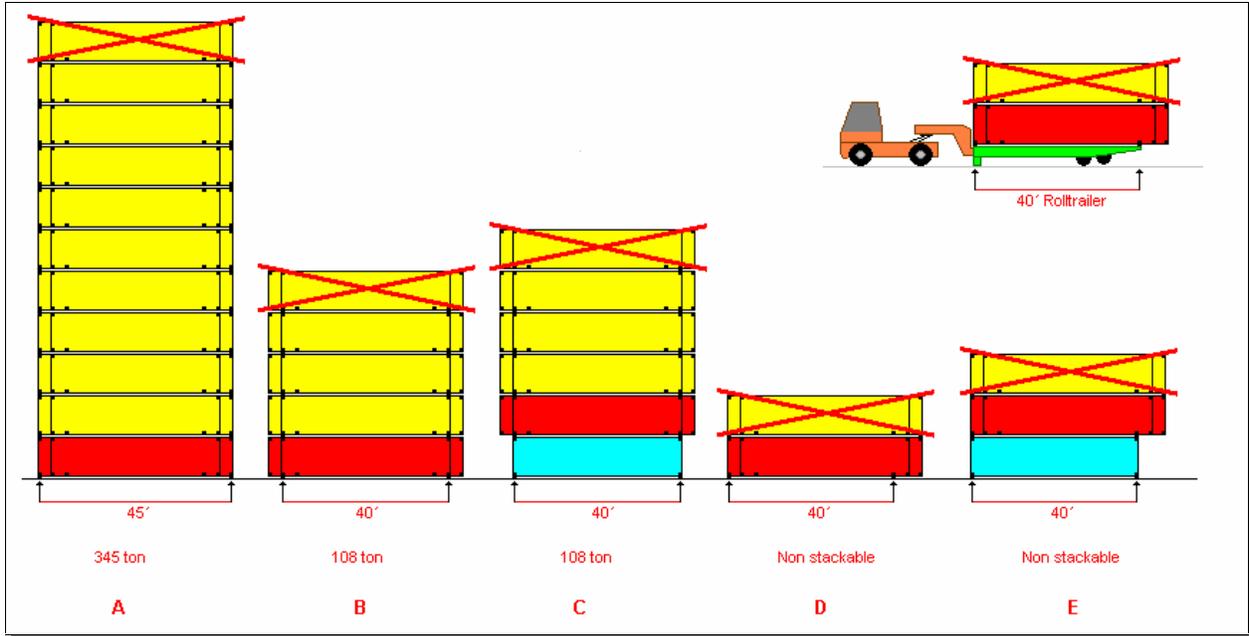


Figure 2.6) Different stackability on top of a lowest 45ft container depending on corner fittings used. Source: Hallbjörner, 2004, based on Cronos container specification, www.cronos.com

To obtain full operability both in LoLo and RoRo the 45ft container must be equipped with 12 fittings on the floor. Using the 45ft-distance (A) full ISO stackability is reached, but requires a deck layout with corresponding strength and outfitting. Using the 40ft-distance (B and C) the stackability is reduced to 108 ton. Using same fittings as 40ft-containers generates a need of extra 2.5 feet fore and aft of the unit. In case of close bulkheads, conventional stowage arrangement or the use of 40ft-rolltrailers/cassettes (D and E) the container must use one of the end positions. This mode can normally not offer stackability, if not further strengthening of the unit is made.



Figure 2.7) Container feeder LoLo-vessel, with a 45ft container stowed on top of a 40ft container. Source: www.containerhandbuch.de (acc: 2004-06-30)

Chamfered fronts

In order to make the 45ft container legal on EU roads the front corners may be designed as illustrated in Figure 2.8. This design, which is a patent, is named “chamfered fronts”.

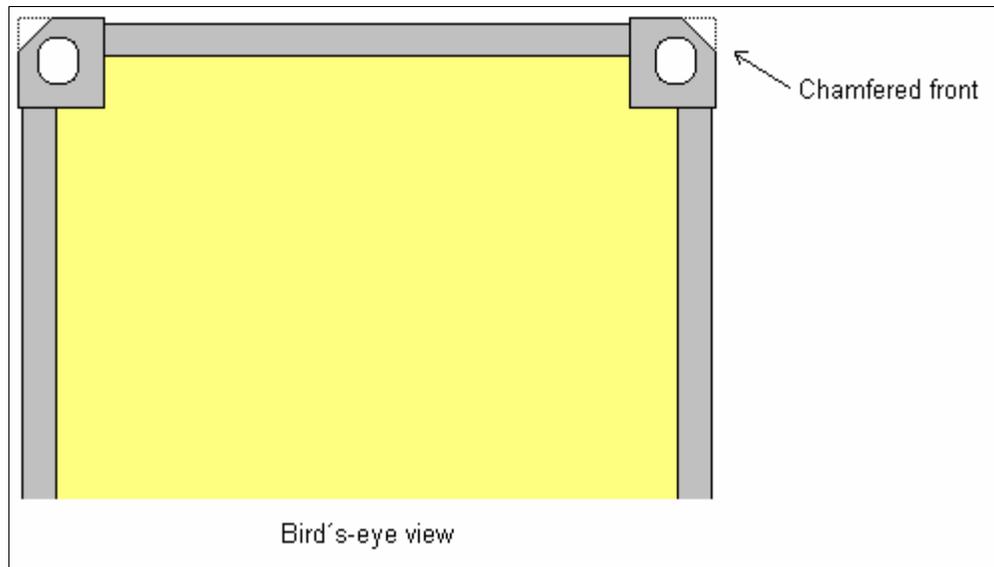


Figure 2.8) Illustration of what is meant by “chamfered fronts”. Hallbjörner/Tyrén, 2004.

Transport costs

Transport costs may be viewed in a variety of perspectives. The two main perspectives are direct (or internal) and external costs. Direct costs are charged to the carrier. They may consist of wages, fuel, interest and depreciation, rent, etc. The direct cost for an intermodal transport may be divided into road, rail, shipping, storage and handling costs. External costs are costs caused by the transport, but not charged. Examples of external costs are congestion, noise, accidents, global warming, air pollution, etc.⁵⁰

The shipping cost

The shipping cost is a direct cost. There are four main cost categories distinguished in the running of ships, namely the capital costs, the operating costs, the voyage costs and the cargo handling costs⁵¹. The capital costs consist of interest and depreciation of the ships value. The operating costs consist of manning, maintenance, repair, stores, insurance, etc. The capital and operating costs together forms the T/C-equivalent⁵². The voyage costs consist of bunker, port dues, canal fees, etc. The cargo handling costs are the stevedoring fee for loading and discharging the vessel. The cargo handling cost is covered by the ship owner in case of “full liner terms”.

To calculate the profit for a voyage or for several voyages, a voyage calculation is made, subtracting the voyage and cargo handling costs from the freight revenue, making a surplus that

⁵⁰ Lumsden, Kenth (1989), **Transportekonomi – Logistiska modeller för resursflöden, Studentlitteratur**, Sverige – page 36 and 50

⁵¹ Wijnolst, N and Wergeland, T (1997), **Shipping**, Delft University Press, Delft – page 204

⁵² Time Charter equivalent, i.e. the costs covered by the owner if the charter hire the vessel on time charter.

should cover the T/C-equivalent for the period.⁵³ The freight rate is a result of the market mechanisms where supply and demand meet.⁵⁴ In liner shipping, which is the common way to operate containers, usually tariffs are used, formed to compete with other operators or modes of transports. The voyage result in liner shipping is very much affected by the booking for each voyage, the number of units loaded and the need to shift⁵⁵ cargo in ports. Generally the size of ship is the overwhelming factor to the shipping costs: the bigger vessel the less shipping cost per loading unit.⁵⁶ Here we can see the connection between design and choice of cargo unit. Only by simulating different types of containers we may judge the consequences to the shipping cost per pallet or per ton cargo.

2.2 The EILU-proposal

To summarise the EILU-proposal, its content and message, we start from the introduction of the proposal:

“The Community must propose a sustainable solution to transport problems, which can reduce congestion, particularly road congestion. It is therefore in the Community's interest to make intermodality more attractive for transport users. Nowadays, carriers use several multimodal methods of transport:

- Drivers of road vehicles go on specially equipped trains or ferries with their vehicle. This is accompanied transport.
- Semi-trailers specially designed for this purpose are dispatched, particularly on trains. Special wagons have been designed for this.
- Containers⁵⁷ or swap-bodies⁵⁸ are transferred from one mode of transport to another.

This proposal only deals with the latter case.”⁵⁹

The proposal deals with two main areas. On the one side the periodic inspections and CE marking of ILUs and on the other side the definition of the EILU-standard, combining the benefits of containers (their solidity and stackability) and of swap-bodies (in particular their greater capacity). It is the latter subject, the EILU definition, that we are studying. The EILU-proposal continues:

⁵³ Wijnolst, N and Wergeland, T (1997), **Shipping**, Delft University Press, Delft – page 232

⁵⁴ Wijnolst, N and Wergeland, T (1997), **Shipping**, Delft University Press, Delft – page 297

⁵⁵ Shifting cargo in ports is sometimes necessary when the cargo planning fail to make cargo for one port be reachable due to blocking cargo loaded for a subsequent port. Shifting cargo is expensive and time consuming.

⁵⁶ Wijnolst, N and Wergeland, T (1997), **Shipping**, Delft University Press, Delft – page 509-521

⁵⁷ Container: a box to carry freight, strong enough for repeated use, stackable and fitted with devices for transfer between modes.

⁵⁸ Swap-body: a freight-carrying unit optimised to road vehicle dimensions (basic difference compared to containers) and fitted with handling devices for transfer between modes, usually road/rail.

⁵⁹ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), ”Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units” - Introduction

“In order to meet the necessary requirements for maximum intermodality, it should be stackable, suitable for top lifting and seaworthy. The unit should offer the maximum allowable space for transporting ISO⁶⁰ pallets, and it should also offer fast loading and unloading of pallets in order to reduce costs and delays. This EILU can consist of a general-purpose dry cargo box allowing two pallets to be loaded side by side. The effective internal width must therefore be at least 2 x 1200 mm plus the necessary margin for manoeuvre, which is still to be determined. The external width should be as small as possible, ideally 2 500 mm, in order to take account of the guide rails which exist in some ships. In any case, the EILUs should be able to be carried by road. They must therefore comply with the provisions of Directive 96/53.⁶¹ There are only a very few ILUs which meet these requirements.”⁶²

The above statement results in two units, one long EILU and one short EILU. The sketch below shows the required minimum internal dimensions, manoeuvring space excluded:

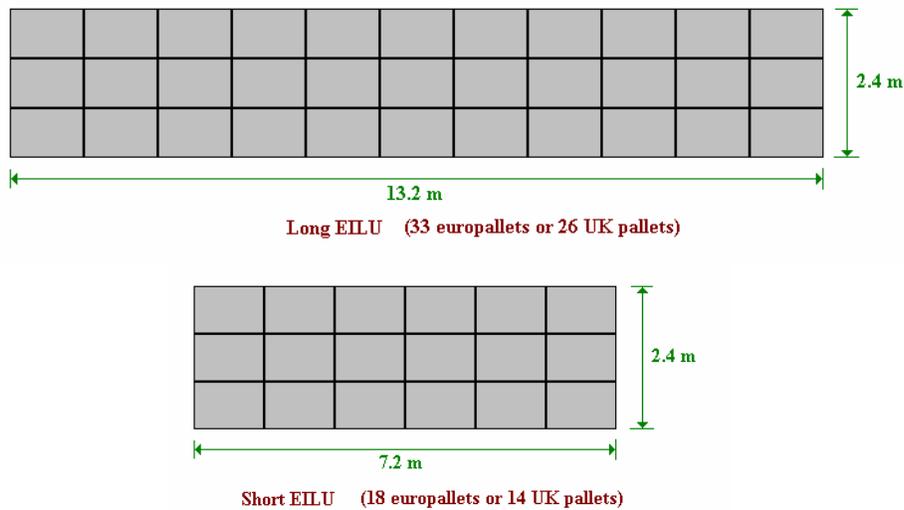


Figure 2.9) Minimum internal dimensions of the EILU. Source: EILU-proposal, annex B

The result is an EILU. “European Intermodal Loading Unit” means an intermodal loading unit constructed in accordance with the essential requirements set out in Annexes I and II, COM(2003) 155, and the requirements for interoperability.

⁶⁰ Pallet: a raised platform, normally made of wood, facilitating the handling of goods. The standard dimensions most used in Europe are: 800 mm x 1200 mm and 1000 mm x 1200 mm (ISO 6780).

⁶¹ Council Directive 96/53/EC laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic.

⁶² Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), “Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units” - Introduction

Safety and security:	Comply with relevant provisions... Minimise risk of damage... Equipped with anti-intrusion alarm...
Handling:	Enable efficient manipulation, inter alia by means of handling equipment adapted to ISO containers.
Securing:	Make securing devices compatible with the four modes of transport.
Strength:	ILUs must not break... ILUs must be able to withstand every days knock ...
Coding and identification of units:	Use state-of-the-art electronic coding and identification.

Figure 2.10) Summary of **Annex I** to the EILU-proposal
Source: The EILU-proposal.

Weight and dimensions:	Comply with the provisions of Directive 96/53 (OJ L 235, 17.9.1996, p.59.)
Type:	General purpose dry cargo box
Internal length:	Long: 11 x 1200mm + manoeuvre Short: 6 x 1200mm + manoeuvre
Internal width:	2 x 1200mm or 3 x 800mm + manoeuvre
External height:	2670mm
Strength of construction:	ISO 1496 series of standards, where applicable. Stackability: Long: 4 high Short: same as ISO C20' Sufficient racking strength Top lifting capacity

Figure 2.11) Summary of **Annex II** to the EILU-proposal.
Source: The EILU-proposal.

The EILU-proposal takes full use of the former work undertaken by the CEN and the UTI-NORM research.⁶³ The external dimensions are discussed, but only the height is clearly decided to be 2.67 m. From the content we may conclude following guidelines regarding the external dimensions:

Height: = 2670 mm
Width: =< 2550 mm (preferable 2500 mm)
Length long EILU: =< 13600 mm
Length short EILU: =< 7820 mm

⁶³ UTI-Norm (1999), "Current State of Standardisation and Future Standardisation Needs for Intermodal Loading Units in Europe", Contract no JC-98-RS.5039

Further, the EILU-proposal calculates that the number of road vehicles required to transport the same amount of goods would be reduced by about 25%⁶⁴ if all fully loaded ILUs were to be replaced by fully loaded EILUs. This calculation is made by calculating the pallet capacity of the world fleet of ISO-containers, putting this number of pallets into EILUs, and calculating the number of EILUs needed. The reduction of units is thereafter assumed to be equal to the savings in number of road vehicles.

The EILU-proposal (the part with proposed dimensions) states: “It will not be compulsory to use the EILU. Instead, it will be left to people working in this sector in Europe to discover its benefits.”⁶⁵

2.3 Literature and public material

During our studies we got ample relevant information in the literature and material from conferences, meetings and websites. Some of it is used in our study as secondary data, as complements to the collection of primary data.

The closest document to the EILU-proposal is the “**UTI-Norm Final Summary Report**”, dated 1999-09-28. The UTI-Norm report gives more details about existing containers, in a more global perspective, considering different types, applications, standards and versions of containers. The US domestic container as well as the proposal of the ISO Series 2 is included.

ISO Series 2 containers:	Length(mm)	Width(mm)	Height(mm)
	7 430	2 590	2 900
	14 900	2 590	2 900

The proposal of ISO Series 2 met huge resistance due to necessary change in road regulations and investments needed in ships and terminals, and was therefore abandoned.⁶⁶ The ISO Series 2 is a huge step. The perspective of time is the next generation of ships, the perspective on geography is global, and the idea is “clean”⁶⁷, with stackable, combinable short and long units, wide bodies.

The UTI-Norm report also considers the difference in RoRo and LoLo Ship Operations. RoRo:s are confirmed to be flexible and welcoming a variety of loading units, while the LoLo vessels are designed for a particular unit size or mix for a high degree of utilisation.⁶⁸

⁶⁴ See the calculations and assumptions in the Annex to the Explanatory Memorandum, of the EILU-proposal.

⁶⁵ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), ”Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units” – Section 6.2, paragraph 24.

⁶⁶ UTI-Norm (1999), “**Current State of Standardisation and Future Standardisation Needs for Intermodal Loading Units in Europe**”, Contract no JC-98-RS.5039 – pages 88-91

⁶⁷ The authors use “clean” as an expression of a self-sustained system reaching better utilisation.

⁶⁸ UTI-Norm (1999), “**Current State of Standardisation and Future Standardisation Needs for Intermodal Loading Units in Europe**”, Contract no JC-98-RS.5039 – pages 105-106

Further the UTI-Norm recommends general specification for a system of European Loading Units for intermodal transport. Some discrepancies vis-a-vis the EILU-proposal were found. Most interesting was the recommended height: “An outside height of 2900 mm for the European loading unit is recommended. Increasing demand for special European loading units offering an inside loading height of 3000 mm can be foreseen and may have to be accommodated in standardisation in the future.”⁶⁹ This is exactly the same message as we got from one of the respondents in our pilot study. The EILU-proposal states the external height to be 2670 mm.

Positions of corner fittings are recommended in the UTI-Norm report to be corresponding to the 40ft and 20ft positions, leaving overhang symmetrically, in the same way as for swap-bodies, but added with top corner fittings for lifting⁷⁰. This solution may have operational problems as the overhang may intrude upon bulkheads, passage ways or other container positions onboard. The EILU-proposal does not discuss the position or number of corner fittings.

An article in **World Cargo News**, May 2003, describes the EILU-proposal from a market view. The article, which confirms the laudable purpose, considers the EILU-proposal to be false and wrong, ignoring the arguments given from the shipping industry. The author concludes the EILU-proposal to create stackable swap-bodies, and inform that this work has already started within the CEN. Out of noble and interesting problem analysis the EILU-proposal is missing the obvious solution, the pallet-wide ISO containers of 20ft, 40ft and 45ft length. Why create a new size, with no half length unit, which will inevitably be incompatible with what is happening on the international arena? The reluctance from EU authorities to consider the 116mm difference between the long EILU and the 45ft container to be allowed is highlighted in the article.

Meeting the criticism two reports were made, closely related to the EILU-proposal. Both studies are published on the EU website for “Standardisation and Harmonisation of Intermodal Loading Units”⁷¹, and carried out on request of the Commission. Following information is brought from the EU website:

“Economic Analysis of Proposed Standardisation And Harmonisation (ICF).

This study examines the costs and benefits of the proposed Directive, and comes to the following conclusion:

- The proposed Directive would have significant benefits for the efficiency of the intermodal transport system. Reduction in transport costs can reach up to 10%, depending on commodities and transport corridors.
- Aggregate logistics cost savings would attain an average of around 2% for dry cargo goods moving a distance of at least 400 kilometres.
- Better maintenance and more efficient handling of boxes in intermodal terminals will be another important consequence.

⁶⁹ UTI-Norm (1999), “**Current State of Standardisation and Future Standardisation Needs for Intermodal Loading Units in Europe**”, Contract no JC-98-RS.5039 – page 150

⁷⁰ UTI-Norm (1999), “**Current State of Standardisation and Future Standardisation Needs for Intermodal Loading Units in Europe**”, Contract no JC-98-RS.5039 – page 153

⁷¹ http://europa.eu.int/comm/transport/intermodality/legislation/standardisation_en.htm (acc:2004-07-01)

- The final price of many consumer goods could be reduced by up to 0.2%, which is a significant figure overall.

The proposed – and voluntary – European intermodal loading unit will bring further efficiency gains through improved capacity and handling. Efficiency benefits up to 1.5% may be obtained, on condition that a significant number of European intermodal loading units are present in the market.

**Technical study on the harmonisation and standardisation of intermodal loading units
Project ETU/B2 – 704 – 507.15476 72002 (BIC)**

This study examines the main technical issues arising out of the proposed Directive. Its main findings are:

- The proposed European intermodal loading unit corresponds largely to the results already elaborated by the European Standardisation bodies (CEN) laid down in C 745 “Stackable swap-bodies” and A 13471 “Swap-bodies”.
- The proposed European intermodal loading unit can be carried without any problem on current road vehicles, and on the vast majority of track in the European rail network, using available rolling stock.
- The European intermodal loading unit can be carried without any problems in short sea transport on today’s Ro-Ro ferries, which exist in large numbers. The unit can be carried side by side on inland waterway ships and cellular maritime ships. There should not be any major maritime carrying capacity issues, unless the unit reaches a market penetration of more than 25%.

The proposed European intermodal loading unit is fully competitive vis-à-vis road transport, the quality benchmark.”⁷²

Despite the obvious connection to the EILU-proposal both reports make own interpretations and proposals on how to solve the problem. For example the economic analysis (ICF-report) meets technical problem and therefore recommends the desirability of a 13.72m square-front EILU to maximise compatibility with short sea shipping and deep-sea ISO containers and permit CEN the flexibility to include multiple height standards for the EILU, including at least from 2.67m – 2.90m.⁷³ The report informs about the patent making a 45ft container legal on EU roads via chamfered front corners. The potential saving for the final consumer of between 0.02 to 0.2% is declared. The report does not consider the increased mix of different types of units’ onboard vessels as the models used don’t include such parameters.

On the other hand, the technical analysis (BIC-report) communicates the problem with mixing of units and more difficult stowage planning. The differences between RoRo- and LoLo-vessels are described and the difference between 13600mm and 13716mm (45ft) discussed. The report concludes the necessity of mixing ISO-containers and EILUs onboard vessels in order to utilise

⁷² http://europa.eu.int/comm/transport/intermodality/legislation/standardisation_en.htm (acc:2004-07-01)

⁷³ ICF Consulting (2003-10-13), **Economic Analysis of Proposed Standardisation And Harmonisation Requirements**, Belgium – page 5

the full capacity of the vessel⁷⁴, meeting further restrictions to stowage planning and port rotation. The report also communicates the demand of some actors for adjusting the road restrictions to increase the maximum height to 4150mm, width to 2600mm and length to 13716mm.

More information is collected from the **CEN Forum** on Short Sea Shipping – Intermodal Loading Units (ILU), 2003-10-02 in Brussels. Many of the above questions and problems were brought to discussion. Again the 45ft container is frequently discussed and viewed the more global geographical perspective. “Inter-European trade cannot be distinguished from international trade as many inter-European container loads are carried on container vessels going on international routes – e.g. from Scandinavia via the Mediterranean sea to Asia and purpose build EILU carriers will be restricted to inter-European trade with resulting higher transportation costs, because of vessels being purpose built to a limited market.”⁷⁵ The **International Road Transport Union (IRU)** declared the same position saying “there is no use in creating a specific ILU, which cannot be used outside Europe.”⁷⁶ The **European Community Shipowners’ Associations (ECSA)** recommends the CEN to complete its work on stackable swap-bodies and then encourage their use and allow the 45ft ISO container on the European roads.⁷⁷

The **European barge union (EBU)** declares “an introduction of a new standard measurement will have drastic consequences for today’s material, terminals, infrastructure (locks, bridges, etc.) and will consequently lead to big investments on many levels, when the proposed unit will be introduced. Therefore we are afraid that the advantages won’t balance the disadvantages.”⁷⁸

The **European Sea Ports Organisation (ESPO)** in general supports the EILU-proposal regarding the interoperability, but has substantial doubts about the proposal of the Commission to create a standardised EILU. An EILU will duplicate with ISO units and even create confusion. It would have the counter-productive effect of going against the general worldwide trend of ISO container shipping.⁷⁹ Also the ECASBA FONASBA 2003⁸⁰, Istanbul, Turkey, declared the resistance to establish a European container standard. Such as described in the EILU-proposal, it most probably would bring contrary effect than the supposed.

⁷⁴ BIC Study team, et al (2003-10-12), “**Technical study on the harmonisation and standardisation of intermodal loading units**”, Project ETU/B2 – 704 – 507.15476 72002, Paris – WP3, page 27

⁷⁵ CEN (2003), “**Report of open CEN Forum on Short Sea Shipping – Intermodal Loading Units (ILU)**”, Brussels – page 10

⁷⁶ CEN (2003), “**Report of open CEN Forum on Short Sea Shipping – Intermodal Loading Units (ILU)**”, Brussels – page 17

⁷⁷ CEN (2003), “**Report of open CEN Forum on Short Sea Shipping – Intermodal Loading Units (ILU)**”, Brussels – page 19

⁷⁸ European barge union, EBU (2003), “**Intermodal loading units – harmonization and standardization initiative**”, **Comments on th EC communication on the promotion of short sea shipping**, Brussels/Rotterdam, The Netherlands, September 2003

⁷⁹ European Sea Ports Organisation, ESPO (2003), “**Proposal for a Directive on Intermodal Loading Units COM(2003)155 – ESPO contribution to EP first reading**”, Brussels, 2003-09-22

⁸⁰ ECASBA, the (European Community Association of Ship Brokers and Agents) was established in 1990 as the European sub-committee of FONASBA (The Federation of National Associations of Ship Brokers and Agents). www.ecasba.com (acc: 2004-05-24)

The **Federation of European Private Port Operators, FEPORT**, concurs to the massive criticism and contributes to our problem definition by explaining the functionality and condition for smooth operation of container gantries and the so-called “spreader flaps”. The spreader flaps are dependent on the external dimensions of the corners, and of course also the fact that the corners fittings are put in the same position.⁸¹

The modular concept and potential to gain savings and better utilisation was highlighted on the EILU-conference held 2004-01-21 in Göteborg. In the material “**Impact of Vehicle Size on Transport Efficiency**” Professor Kenth Lumsden and Ulf Ehrning promote and argue for the Swedish/Finnish modular concept. They presented calculations on how more efficient modular concepts may reduce the number of road vehicles. Lumsden/Ehrning show in Figure 2.11 how three vehicles may be two, with reduced fuel consumption, emissions, road space, road damage and cost per tonkm. They continue with a presentation of a “road efficiency and fuel efficiency index” enabling comparison to different vehicle classes.

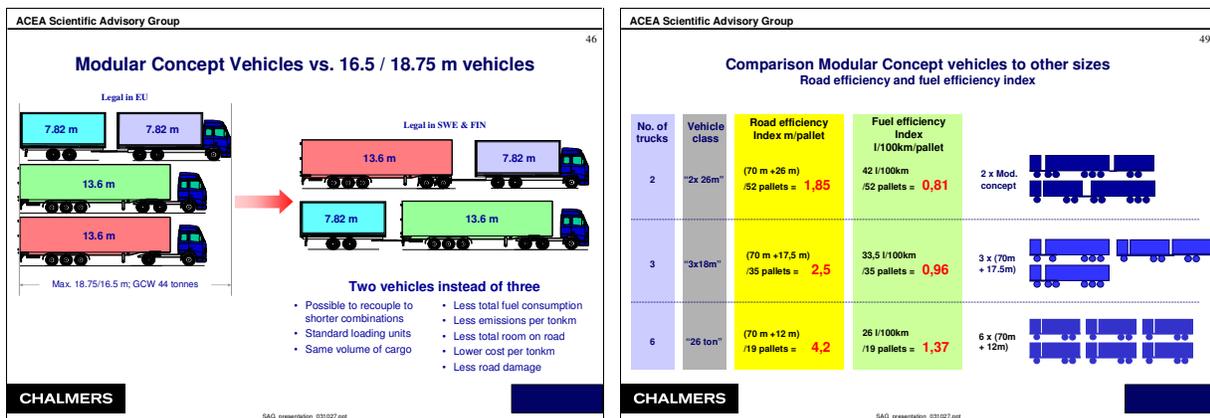


Figure 2.12) The Modular Concept. Source: Lumsden/Ehrning, 2004.

The message is simple: the longer road vehicles the better capacity and more environmental friendly road transports. But Lumsden/Ehrning also tell that this is not the whole truth, as there always must be smaller vehicles and also that much capacity is lost today because of poor filling and by positioning of empty units. This perspective and message give valuable input to our problem definition.

Discussing benefits of modular systems and intermodalism, three cases using **RECORDIT** was presented in Brussels, 2002-05-14/15. Both internal and external costs are considerably lower for the intermodal solution versus the all-road transport. In two of the cases the reduction is about 18% as illustrated in Figure 2.13. “The intermodal option turns out to be consistently cheaper than the all-road alternative, despite being longer. Its competitiveness is however severely undermined by the poor performance of intermodal transport in terms of trip duration, which is between 70% (Patras-Gothenburg) and 400% (Genova-Manchester) longer than for all-road.”⁸²

⁸¹ Federation of European private port operators, FEPORT (2003), “**Harmonisation and standardisation of loading units – Consultation Paper**”

⁸² Ricci, Andrea (2002), **Pricing of intermodal transport: lessons learned from RECORDIT**, ISIS – Institute of Studies for the Integration of Systems, Rome, Italy – section 5.2

Internal costs of intermodal Vs all-road transport

Corridor	Intermodal			All-road		
	€/movement	Length (km)	€/km	€/movement	Length (km)	€/km
Genova-Manchester	2315	2134	1.08	2836	1912	1.48
Patras-Gothenburg	3970	4128	0.96	4894	3599	1.36
Barcelona-Warsaw	3350	3270	1.02	3448	2735	1.26

Figure 2.13) Savings in internal costs. Source: RECORDIT

Also the external costs were found to be lowered (50%) in the intermodal alternative, considering up and downstream, electricity production, congestion, noise, global warming, accidents and air pollution.

The great variety of intermodal options, unit types, modes, carriers, combinations, etc. makes coordination difficult and complicated. Different companies and different software tools are developed to support such decision making and strategies. One project founded by the Commission was **LOGIQ**, with its final report year 2000. The LOGIQ report concludes the cost and reliability to be the most important criterion in the decision-making process.⁸³

The report “**Development trends regarding unit load transport by sea and rail**”, by PhD Johan Woxenius, lists advantages and disadvantages using containers, swap-bodies and semi-trailers, giving about the same message as the EILU-proposal. The 45ft pallet-wide container with chamfered fronts is mentioned as a cargo unit fulfilling the EILU requirements.⁸⁴ Woxenius expresses the need of standards and assumes the EILU to be close to the ISO standard in order to avoid problems for shipping. Problems are likely to arise on LoLo-vessels with cell guides, but the advantage is judged to be onboard RoRo-vessels and railway. The ocean going vessels are excluded as the ISO-container will continue to be dominating there. Woxenius here looks toward RoRo:s.

It is obvious that the 45ft container and the negligence by EU to accept the 13.716m to be maximum length on EU roads, create a problem. Prohibiting the 45ft length will create barriers for both shipping and shore based transports, as goods shipped to Europe in 45ft containers must be re-stuffed into other units on arrival to Europe, an expensive and time consuming task.⁸⁵

We now arrive at the terminal. Actually there is another EU project designing a system for **Improved Port/Ship Interface (IPSI)**, also mentioned by one respondent of our pilot study, reaching a solution with new design both to ships and terminals. The IPSI-project led to “the adoption of a RoRo alternative, despite the fact that RoRo today is considered a more expensive

⁸³ Gruppo CLAS et al (2000), ”LOGIQ – Final report for publication”, Contract No IN-97-SC.2237, 2000-05-30

⁸⁴ Woxenius, Johan (2003), **Development trends regarding unit load transport by sea and rail**, Chalmers University of Technology, Göteborg – pages 35-40

⁸⁵ Erhvervs- og Boligstyrelsen (2003), “**Godstransport**”, Denmark, Samspil mellem transportformer: Fjernelse af tekniske barrierer, section 4.1 European Intermodal Loading Unit (www.ebst.dk) acc 2004-02-19

solution than conventional container handling.”⁸⁶ This was mainly due to the fact that the semi-trailer is an efficient intermodal loading unit and the IPSI may handle all kind of boxes and trailers placed on cassettes. The IPSI system therefore may be defined as an “open” system possible to combine the feeder of intercontinental containers with intra-European transport, attracting cargo from the road. The IPSI-project gives a lot of input to the perspective on connecting different parts to a complete transport system, contributing a lot to our problem definition.

To conclude the above review we look at some shipping operator / equipment supplier menus of intermodal loading units. What units are offered today attracting volume cargo on pallets? Here are a few examples of units offering large pallet-wide cubic.

Paltrans is a Swedish short sea shipping operator with LoLo-services from Sweden to the UK and the Continent. The units described above are used in the UK-service and loaded on Paltrans vessels, employed on long term time charters. On 2003-04-13 Paltrans announced an investment on further 80 pcs of 45´ pallet-wide containers declaring: “We have noticed a strong demand for these units and we have made this investment especially to be used in competition with the trailer-operators”⁸⁷.

Unit type:	40´Wide body high cube	45´Wide body high cube
Gross weight (kg):	35,000	34,000
Payload (kg)	30,750	29,550
External dimensions	12,182	13,716
L x W x H (mm):	2,500 2,896	2,500 2,896
Internal dimensions	12,050	13,556
L x W x H (mm):	2,420 2,676	2,420 2,691
Capacity of Europallets	30	33

Figure 2.14a) Paltrans loading units. Source: Based on www.paltrans.se

Finnlines main operating areas are between the Baltic Sea and North Sea. The fleet comprises some 90 vessels, consisting mainly of RoRo, RoPax and LoLo container vessels.⁸⁸

Unit type:	40´Eurobox	40´Eurojumbo
Gross weight (kg):	30,480-34,000	30,480-34,000
Payload (kg)	26,430-29,740	26,270-29,500
External dimensions	12,192	12,192
L x W x H (mm):	2,460-2,500 2,591	2,460-2,500 2,896
Internal dimensions	12,045-12,100	12,045-12,100
L x W x H (mm):	2,420-2,440 2,380-2,383	2,420-2,440 2,676-2,690
Capacity of Europallets	30	30

Figure 2.14b) Finnlines loading units. Source: Based on www.finnlines.fi

⁸⁶ Hamworthy KSE AB et al (1999), “Improved Port/Ship Interface – Final report for publication”, Contract No WA-95-SC.140 – page 9

⁸⁷ www.paltrans.se (acc: 2004-07-05)

⁸⁸ www.finnline.fi (acc:2004-07-05)

Also ocean line operators offer wide bodies on their websites:

	CMA-CGM ⁸⁹	ACL ⁹⁰
Unit type:	40' Pallet-wide (Mac Andrews)	40' Pallet-Wide Cont. (2.5 M)
Gross weight (kg):	34,000	24,158
Payload (kg)	29,750	19,958
External dimensions	12,192	12,192
L x W x H (mm):	2,462 2,896	2,489 2,591
Internal dimensions	12,095	12,040
L x W x H (mm):	2,422 2,692	2,438 2,337
Capacity of Europallets	30	30

Figure 2.14c) Loading units offered by CMA-CGM and ACL.

Source: Based on www.cma-cgm.com and www.aclcargo.com

Equipment suppliers offer a huge variety of containers, also pallet-wide containers of different sizes and dimensions, for example:

	Consent Equipment ⁹¹	Cronos ⁹²	Cronos
Unit type:	45' containers 2.5 m wide	40' Slimwall CPC	45' Slimwall CPC
Gross weight (kg):	34,000	34,000	35,000
Payload (kg)	29,700	29,800	30,380
External dimensions	13,716	12,192	13,716
L x W x H (mm):	2,500 2,775	2,462 2,896	2,462 2,896
Internal dimensions	13,553	12,095	13,540
L x W x H (mm):	2,426 2,563	2,420 2,690	2,420 2,690
Capacity of Europallets	33	30	33

Figure 2.14d) Loading units offered by Consent Equipment and Cronos.

Source: Based on www.consent.se and www.cronos.com

2.4 The problem definition and delimitations

Based on the above studies we define our problem subtracting the delimitations from our purpose.

Formula: Purpose – Delimitations = Problem definition

The EILU-proposal is dealing with the problem how to “propose a sustainable solution to transport problems, which can reduce congestion, particular road congestion.”⁹³ This main problem is divided into three part problems, namely:

⁸⁹ www.cma-cgm.com (acc: 2004-07-05)

⁹⁰ www.aclcargo.com (acc: 2004-07-05)

⁹¹ www.consent.se (acc: 2004-07-05)

⁹² www.cronos.com (acc: 2004-07-05)

⁹³ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), ”Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units” - Introduction

- the complexity of handling operations and the lack of interoperability,
- the lack of optimal ILUs that can be used in all modes of transport.
- the need to have a more uniform system for the units' characteristics in the above-mentioned areas, including security and safety.⁹⁴

Our main problem is to highlight possible consequences for shipping, caused by the implementation of such standard, positive or negative. As our main problem is related to the problem to be solved by the EILU-proposal, we connect these. Further we consider the EILU-proposal to be an individual action within the “Programme for the promotion of Short Sea Shipping”, which strengthen the approach to look for consequences for shipping.

The EILU-proposal itself discusses some consequences for ships. These consequences concern the stowage in cellular ships and barges. The EILU-proposal declares: “Any moves towards standardisation involve constraints and limitations. The problems, which the dimensions of the EILU could create, are as follows:

- length:
 - cellular ships and barges would need to adjust their cell guides to a new length entailing marginal costs. In some cases when ships are designed for certain container lengths, the structural requirements might result in less optimum use of cargo space.
 - The long EILU would not allow the capacity of current standard rail wagons to be fully utilised.
- width:
 - An external width greater than 2500 mm could create some problems, for example, on some cellular ships where the cells are only 2500 mm wide. The cell guides would therefore need to be adjusted. There might be some loss of cargo space on certain inland waterway vessels, in particular, on those that are constructed to take four ISO containers side by side without any margin. However, some ships already take non-ISO containers which are 8'6" (approx. 2.59 m) wide.”⁹⁵

It is clear that technical consequences will occur, especially onboard LoLo-vessels. We focus on those consequences. We do not involve in technical consequences outside the ship.

Delimitation: Technical consequences outside the ship.

⁹⁴ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), ”Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units” – Section 6, paragraph 5.

⁹⁵ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), ”Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units” – Section 6.2, paragraph 14

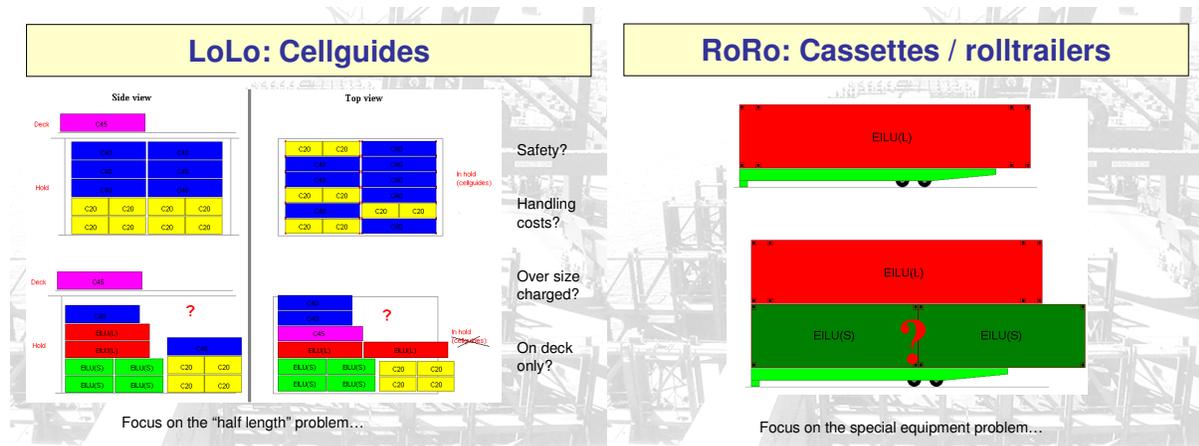


Figure 2.15) Technical consequences. Source: Hallbjörner/Tyrén, 2003.

The use of standard pallets and the requirements for different types of cargo are discussed in our pilot study. There is high density cargo, not using the volume, attracted to 20 feet units. There is low density cargo, requiring large volume, attracted to 40-45ft units. Some cargo is using standard pallets and some not, depending on the intermodal chain and handling. We found as a general consensus that the internal volume is an important feature to a lot of cargo categories. In the same way the access to the intermodal loading unit, i.e. from the short or long side, was raised. To find out the correct mix of high and low density, stowage analysis and means of optimising the utility inside the container cannot be included in our report. We will leave this aspect to be a question of how many types of boxes there will be on the market.

Delimitation: Consequences to stowage of cargo inside the container.

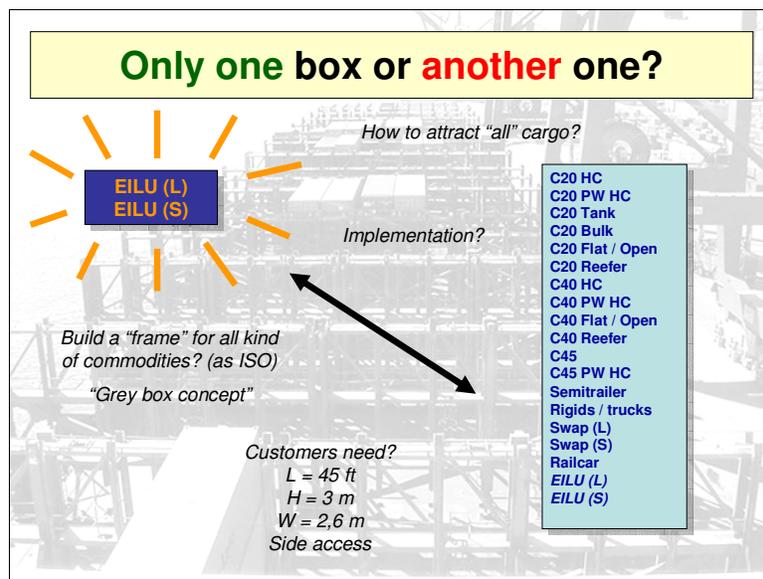


Figure 2.16) Only one box or another one? Source: Hallbjörner/Tyrén, 2003

The ICF-report⁹⁶ tries to make an economical analysis with a holistic perspective. We find the result interesting, but it leaves many questions to answer, e.g. taxes, pricing policies, prognosis in transport needs, labour costs, steel prices, etc. In our report we have chosen not to include these, but only to analyse which effect that the loading unit dimensions have on the shipping cost. The shipping cost is the direct reality to ship operators if they should make profit and be competitive. The shipping cost is a result of the voyage calculation, of which one main input is the average cargo intake onboard.

Delimitation: Economical consequences other than shipping costs, external costs excluded.

We clearly see diversity in perspective, the perspective of geography and the perspective of time. Geographically we sometimes view the problem from a global horizon, sometimes within EU only, and sometime locally, and different results are seen. Regarding time we discuss the restrictions of today, on roads and onboard, as they are not able to change. How about next generation of roads and ships? We like to raise the question of perspective⁹⁷.

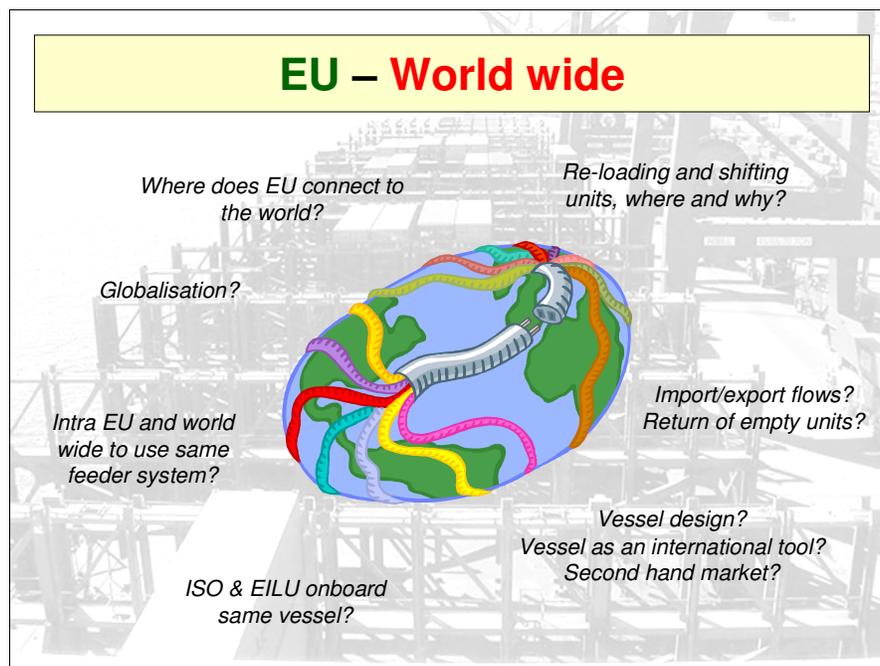


Figure 2.17) EU or World Wide? Source: Hallbjörner/Tyrén, 2003

The problem definition: Our problem is to find possible technical consequences onboard ships, caused by the implementation of the EILU-proposal, and its effect on the shipping cost, in European short sea shipping.

⁹⁶ ICF Consulting (2003-10-13), **Economic Analysis of Proposed Standardisation And Harmonisation Requirements**, Belgium

⁹⁷ The perspective question was raised by Mr Ulf Granander, MD of ACL Sweden AB, during a seminar at the Logistics and Transport conference, 2004-05-25, Göteborg, Sweden.

3 Methodology

This chapter describes the methods used in our study. We describe the data collection method and discuss the evaluation including the validity and the reliability of the results.

Our research process starts from a problem definition and limitation, i.e. what possible consequences would a new European container standard (EILU) imply on short sea shipping? This main problem is divided into several individual problems described in chapter 2. To solve each individual problem we need information to collect and analyse. Between the need of information and the start of data collection we find a barrier (ref. Figure 3.1). This barrier may consist of secondary data (reports already made) or lack of resources in time or money.

Depending on the nature of the problem and information needed we chose an appropriate data collection method, which we found to be a combination of case studies and models. Analysis and interpretation of this data in combination of secondary data and the pilot study made give the conclusions and feedback needed to answer the question. Our research process may be illustrated as in Figure 3.1 below⁹⁸.

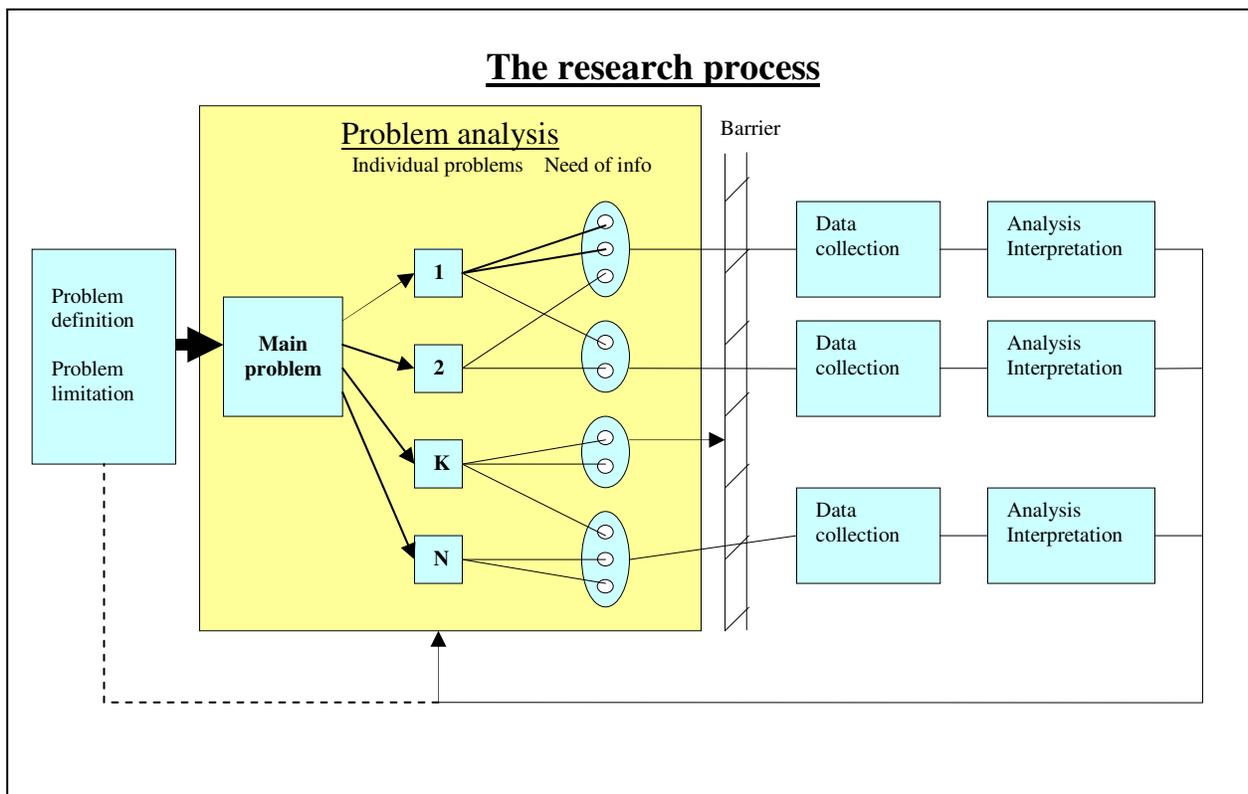


Figure 3.1) The research process. Source: Stefan Pernzelius, 2003

⁹⁸ Seminars in methodology by lecturer Stefan Pernzelius, 2003.

After the choice of the overall strategy to cope with the research problem, the choice of research design follows.

3.1 Research design

A research design may be classified as exploratory, descriptive or causal⁹⁹. The choice of research design is made up depending on the extent of knowledge of the problem before the research starts.

An *explorative* research design has an unstructured problem structure and aims to supply with further knowledge of the problem. When a problem is badly understood, an exploratory design is adequate. The approach of the investigation is to be flexible and open to the fact that the solution may change direction. The researcher should be able to observe, get information and construct explanation, i.e. theorizing.

A *descriptive* research design is used when there already is a thorough and deep knowledge of the subject. This information is system structured and given precise rules and procedures. The researcher is confronted with conceptual and definitional problems in order to decide procedures of data collection answering the research question.

A *causal* research design is confronted with cause-and-effect problems. The knowledge level may be high and the main task is to isolate causes. The research result should tell whether and to what extent an effort gives desired effect. An example may be to find out to what extent a certain advertising campaign helped in achieving a greater market share.

3.2 Data collection

We distinguish between primary and secondary data. Primary data are data collected for this study exclusively, while secondary data are data already collected, either in statistical material or in other reports. Secondary data may also be found in literature, on the Internet, or information supplied via authorities, institutions or companies.

After passing the barrier (available secondary data or lack of resources) the researcher may carry out experiments, observations, interviews, simulations, case studies or surveys. An overall consideration on which type of data is needed for the particular research problem must be made. Among several types of data we find attitude/opinion data and awareness/knowledge data applicable to our study. Collecting primary data will be done only if secondary data are not available.

The researcher has to decide whether to use a qualitative or quantitative data collection and analysis method¹⁰⁰. Figure 3.2 below gives the difference in emphasis in the two methods.

⁹⁹ Ghauri, P and Grönhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 48-50

Qualitative research is a mixture of the rational, explorative and intuitive, where the skills and experience of the researcher play an important role in the analysis of data. The difference between quantitative and qualitative methods is a reflection of different perspectives on knowledge and research objectives.

Qualitative methods	Quantitative methods
Emphasis on understanding	Emphasis on testing and verification
Focus on understanding from respondent's/informant's point of view	Focus on facts and/or reasons for social events
Interpretation and rational approach	Logical and critical approach
Observations and measurements in natural settings	Controlled measurements
Subjective 'insider view' and closeness to data	Objective 'outsider view' distant from data
Explorative orientation	Hypothetical-deductive; focus on hypothesis testing
Process orientation	Result oriented
Holistic perspective	Particularistic and analytical
Generalization by comparison of properties and contexts of individual organism	Generalization by population membership

Figure 3.2) The difference in emphasis in qualitative versus quantitative methods.
Source: Based on Reichart and Cook (1979)¹⁰¹

Regarding sampling selection and definition of population this is primarily associated with quantitative research. In qualitative research the purpose is seldom to arrive at statistically valid conclusions, but still the sampling issues are important¹⁰².

3.3 Our choice of methods

We find our research design to be exploratory with a touch of descriptive. The knowledge about the EILU is small and therefore justifies an exploratory design. The design requirements may be defined to solve the main problem in finding the answer to what possible consequences the EILU may cause. In the choice of method following considerations were made:

- The EILU-proposal is not implemented
- The details of the proposed standard are not established
- The long EILU is similar to the 45ft pallet-wide container
- Knowledge in unitised transports is extensive
- Knowledge about the EILU-proposal is small
- Mathematical models for calculating technical and economical results are available

¹⁰⁰ Ghauri, P and Grönhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 85

¹⁰¹ Ghauri, P and Grönhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 86

¹⁰² Ghauri, P and Grönhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 120

Based on this we identify our research with the listed characteristics in Figure 3.2 for the qualitative methods. After reading the EILU-proposal, information from the Internet and an article in World Cargo News¹⁰³, we found it appropriate to make a pilot study for the sake of our problem definition. The pilot study was discussed during a conference in Göteborg 2004-01-21, which validated the results and listed individual problems. Part of the problem is rather technical and suits to be studied in mathematical models, i.e. the difference in pallet capacity and effect on the voyage calculation. Also the EILU-proposal uses a calculation model, which makes such methods interesting.

Further research was made via multiple case studies. Case studies may be used in all three modes of research design. Each of those approaches may be of either single or multiple-case studies¹⁰⁴. Case study is a preferred approach when ‘how’ and ‘when’ questions are to be answered¹⁰⁵. We found the proposed long EILU to be close to the existing 45 feet pallet-wide container. Therefore the case study method was possible to use and gave us a much deeper analysis of different consequences, including attitude data and technical data and solutions, compared to other methods available. We find our techniques oriented to the left half in the Figure 3.3 below.

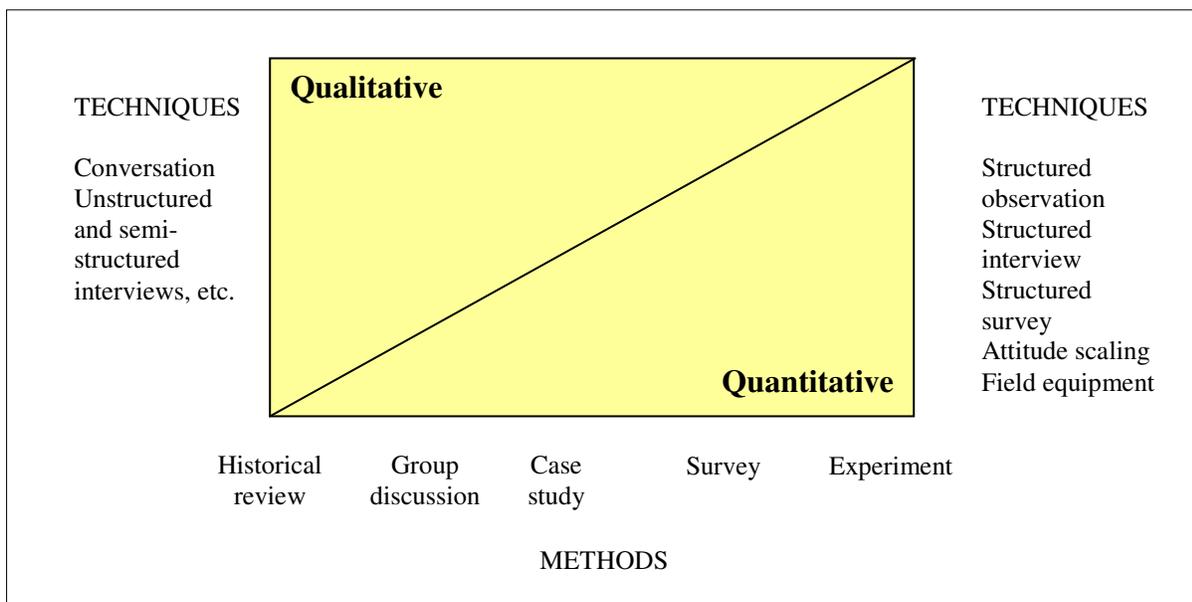


Figure 3.3) Quantitative and qualitative methods and techniques.

Source: Based on Jankowicz (1991:159)¹⁰⁶

The impression of related studies and their methods strengthened us in our research design and choice of methods. Reading articles about the EILU gives the impression that there is a lack of communication and unanimity in regard to understanding what the EU transport problem is. Our

¹⁰³ World Cargo News (2003), “Towards European intermodal loading units”, an article published May 2003

¹⁰⁴ Winston Tellis (1997), “Introduction to Case Study”, The qualitative report, Volume 3, Number 2, page 3

¹⁰⁵ Ghauri, P and Grønhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 172

¹⁰⁶ Ghauri, P and Grønhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 88

research was found to be a part of an initial discussion. The EILU-proposal became a tool and that brought different actors out on the floor. The believed truth from one view came into another light seen from another angle. The problem is rather complex and may be judged from different perspectives. Multiple case studies made this work structured and enabled us to include both quantitative and qualitative data.

3.4 The research process

After the problem definition consisting of literature studies, Internet search, the pilot study and the conference held 2004-01-21, we started to define data to be collected and worked us through the process of case studies. The case study method helped us in structuring procedures for the long and time consuming work in data collection and analysis.

3.4.1 Type of data

The data needed were found to be both quantitative and qualitative. Examples of quantitative data are:

- Internal and external length, width and height of the loading unit
- Payload, pallet capacity and facilities of the loading unit
- Number of onboard stowage positions for different types of units
- Vessel particulars and stowage arrangement
- Voyage details
- Cargo flow statistics

Examples of qualitative data are:

- Preferences in choice of cargo units
- Judgement of the effect of a EILU
- Market aspects
- Importance of different facilities and details of the loading unit

Most of the quantitative data were supplied via secondary data sources as Fairplay WSE database, Eurostat, The Institute of Shipping Analysis (SAI), standards and companies product information. Some quantitative data were collected or confirmed via the case studies. The qualitative data were mainly collected during the pilot study and tested during the case studies.

All data, both quantitative and qualitative, were collected and analysed to judge the possible consequences of a new European container standard (EILU). The measured result is tested in different units in relation to one Europallet,¹⁰⁷ loaded with any kind of goods:

- Transport price per Europallet
- Transit time per Europallet
- Number of Europallets carried per container and/or per ship

¹⁰⁷ Europallet is a standard pallet with dimensions of 1.2m x 0.8m

Economical input data used in the models are “standard” or “average” data used solely to calculate results relevant in relation to each other. The report may not show certain relevant transport cost, as the respondents are very sensitive to the market mechanisms, but expresses the increase or decrease of factors and costs due to the choice and design of loading units. Therefore all figures are to be seen as a symbol enabling some calculations, in order to figure out the effect in action, and to judge possible consequences of a new European container standard.

3.4.2 Case studies

During our pilot study we soon realised two main facts encouraging the use of case studies. The first was the information of the unsatisfactory knowledge of the EILU-proposal. It is impossible to make a survey asking questions about a thing no one has heard about. The second was the variety of perspectives of the issue. What is the problem that the EU has to solve? What is important and what is not? Case studies may give a deeper understanding of possible consequences combining attitudes with facts, documents and an analysis of these.

A case study is often associated with descriptive or exploratory research and particularly useful when the phenomenon under investigation is difficult to study outside its natural setting. The case study method is useful when concepts and variables under scrutiny are difficult to quantify due to the fact that there are too many variables to be considered¹⁰⁸.

Case studies can be single or multiple-case designs. The design may also be categorised as holistic (single unit of analysis) or embedded (multiple units of analysis). A single case is appropriate when a particular case is a critical case which meets all the conditions necessary to confirm, while a multiple case design is appropriate not involving rare, critical or revelatory cases. In a multiple case design every case has to serve a particular purpose in the study¹⁰⁹. As we have to justify the choice of each case we put up criteria to be met, a checklist to be ticked of after nominating the case¹¹⁰.

The choice of case study method depends on the type of study, whether it is inductive or deductive and whether it is looking for a specific or general explanation or not.¹¹¹ As we are doing a study with inductive approach looking for general explanations we use a multiple-case method.

Multiple cases that result in (or show results) in replicating the pattern-matching, may strengthen the validity of our research. However, it is important to bear in mind that generalisation of

¹⁰⁸ Ghauri, P and Grønhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 171

¹⁰⁹ Ghauri, P and Grønhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 179

¹¹⁰ See: Appendix II – Case study protocol

¹¹¹ Ghauri, P and Grønhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 179

results, from either single or multiple designs, is made to theory and not to populations¹¹². Figure 3.4 shows our case study set up, which is defined as multiple case design:

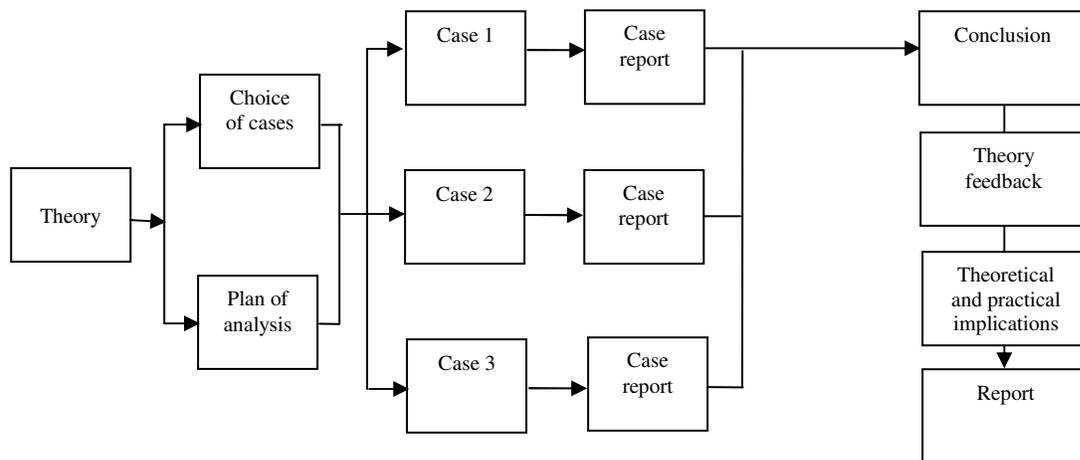


Figure 3.4) “Multiple case study design.”
Source: Lars Bengtsson

We have studied various literature and documents on case study methods. We have mostly benefited from Robert K. Yin. Yin recommends the use of a case-study protocol¹¹³ consisting of four parts, namely:

- Overview of the project
- Field procedures
- Questions
- Guide for the report

Our case study protocol is found in Appendix II, followed by the case reports. Five components of research design important for case studies are the study questions, its propositions, its units, logic linking of the data to the propositions and the criteria for interpreting the findings¹¹⁴. Most of our study questions are brought from the problem definition and pilot study. The units of analysis and the propositions are based on the EILU-proposal and our models. Linking our data to the propositions, the EILU-proposal, makes the base for our conclusions and the answer to our main problem. The cases show the possible consequences of a new European container standard (EILU).

The cases were selected through a process consisting of two parts. First we studied the major flows of containers to, from and through Sweden. This study gave us as a frame to work within.

¹¹² Winston Tellis (1997), “Introduction to Case Study”, The qualitative report, Volume 3, Number 2, page 3

¹¹³ Winston Tellis (1997), “Introduction to Case Study”, The qualitative report, Volume 3, Number 2, page 4, referring to Robert K. Yin (1994).

¹¹⁴ Yin, Robert K. (1994), “Case study research: Design and methods” 2nd edition, Beverly Hills, CA: Sage Publishing., page 20

3.5 Evaluation

After the data collection the analysis and interpretation take place, evaluating the results and formulating an answer to our problem, the possible consequences of a new European container standard (EILU)¹¹⁸. Using multiple-case studies the evaluation process should be pre-defined¹¹⁹. This evaluation process is found in our case study protocol¹²⁰, making the flow chart and the matrix to be our chief tools.

3.5.1 Source of errors

During our pilot study and the case studies it became quite obvious that different data were given based on the role and perspective of the respondent. Also a reluctance or fear of answering was found. Our respondents work in a small segment where all people know each other and their companies compete on an open market. We like to accept and welcome the different perspectives and data derived from such sources. We had to face this possibility of errors or lack of information, and therefore put up a triangulation strategy:

- Identify the role of the respondent and understand his/her perspective
- Follow up data and answers from other sources and come back with counter questions
- Test the results towards models

During all data collection we have traced categories of interest. These are “shippers”, “operators”, “terminal” and “equipment”, making our triangulation strategy possible.

Another source of error was the degree of attention. All the respondents were very busy and occupied with urgent questions in their core business having no possibility to give priority to questions about a “strange” EILU-proposal. We are however very grateful to all people who have contributed to the study, minimising this possible source of error.

3.5.2 Reliability and validity

The reliability and validity¹²¹ of our results may be judged from our research and evaluation process. The competence and background of our supervisors and the pilot study respondents contribute to a good reliability, in combination with communication the EILU-proposal and conducting a problem discussion during the conference held 2004-01-21.

As the reliability refers to the stability of the measure, we struggle with the problem that today's truth about costs and competitiveness may not be the same tomorrow. During our research the

¹¹⁸ Referring to the research process illustrated in Figure 3.1.

¹¹⁹ Winston Tellis (1997), “**Introduction to Case Study**”, The qualitative report, Volume 3, Number 2, page 6, referring to Robert K. Yin (1994).

¹²⁰ See Appendix II

¹²¹ Ghauri, P and Grønhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 67-72

steel price increased and changed the perspective for some respondents. Similar possible changes (e.g. increased interest, changed bunker prices, changed infrastructure charge, environmental taxes) must be considered. Therefore the models and the analysis are working with standard inputs, only using the calculations for comparative purpose, judging the possible consequence of a European container standard. For good reliability we struggled with clear definitions of key terms. It is vital that we are talking about the same thing. When discussing the consequences onboard cellular LoLo-vessels¹²²: Are we talking about a vessel with standard cell guides or a container fitted boxed general cargo carrier?

Our construct validity is assessed through face validity and convergent validity¹²³. Face validity tells us to what extent the measure used seems to be reasonable, and is in our study reached via communication with key respondents in the pilot study. Via the multiple case study design we also obtained convergent validity in addition to face validity.

We have to consider our study to be rather qualitative, which makes the validity in our study to be discussed from the descriptive and interpretative concepts¹²⁴. The descriptive validity judges whether our description holds true. Are the possible consequences of a new European container standard (EILU) true and valid? We also check if our interpretation of the results is correct, i.e. interpretative validity.

Using multiple-case design, we solve the validity questions via triangulation¹²⁵. Triangulation is obtained by collecting data through different methods or sources. Our triangulation strategy is found in all parts of the study, identifying “shippers”, “operators”, “terminals” and “equipment suppliers”. Case studies use different sources of evidence (documents, archival records, interviews, direct observations, participant-observations and physical artefacts)¹²⁶ which strengthen this strategy. Through triangulation we restrain the validity threats and judge our research to be a valid feedback on the EILU-proposal.

¹²² Lift On / Lift Off-vessel, i.e. vertical loading and discharging of cargo.

¹²³ Ghauri, P and Grønhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 70

¹²⁴ Ghauri, P and Grønhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 139-140

¹²⁵ Ghauri, P and Grønhaug, K (2002), **Research methods in business studies – A Practical Guide**, Pearson Education Ltd, England, page 181

¹²⁶ Winston Tellis (1997), “**Introduction to Case Study**”, The qualitative report, Volume 3, Number 2, page 5, referring to Robert K. Yin (1994).

4 Empirical investigations

This chapter describes the pilot study and the case studies we made, searching for possible consequences of an EILU. All details of the cases are found in the Appendix I and II.

4.1 The pilot study

For the sake of the identification of our problem we started with a pilot study. We asked nine open questions to four categories of actors in short sea shipping. The pilot study was performed during November-December 2003 and the full report is given in Appendix I. The four categories are:

1. Shippers (transport buyers)
2. Operators (line operators, ship owners, transporters)
3. Terminals (ports)
4. Equipment (equipment builders, designers, leasing and/or suppliers)

Analysing the answers we illustrate our interpretations by following principle:

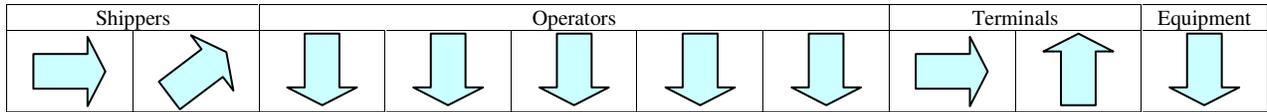
	“positive” - “very good” - “no objections” – “yes”
	“partly positive” - “quite good but with some objections” - “on the right track but not perfect”
	“neutral” - “have no opinion”
	“cannot agree but there are a few points” – “quite negative”
	“negative” – “totally wrong” – “no”

The questions and the results are described as follow:

1. Are you aware of the proposal of a new standard for cargo containers, the European Intermodal Loading Unit, EILU?

Shippers		Operators				Terminals		Equipment	
									

2. What is your reaction to this proposal?



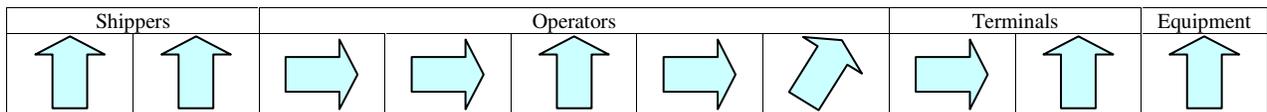
3. What problem/questions would you like us to investigate?

Height – Why not a height of 2.90m?
Width – Why not a width of 2.60m?
Length – Why not a length of 45ft?
Payload – What payload will be offered?
Stowage – How to stow these units onboard vessels?
Potential – Is the potential as great as implied?

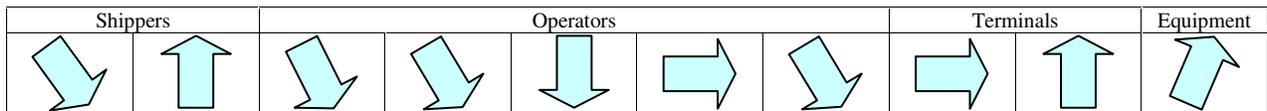
4. Do you interpret the EILU to be of world-wide use or only an intra-EU tool?

Intra-EU only!

5. The main argument is said to make better use of the capacity for transporting standard pallets (page 8). What is your comment to this?



6. Another statement is that Europe needs an optimal intermodal loading unit that combines the benefits of containers and swap-bodies (page 3). What is your comment to this?



7. Do you think the sizes (long and short EILUs) and measurements (height, beam, etc) of the EILU are relevant?

Shippers		Operators					Terminals		Equipment
									

8. Is there a need for a new container standard? Is there a need for an EILU?

Shippers		Operators					Terminals		Equipment
									

9. Are there other ways of reaching the goals of optimising the cargo container and limit detrimental environmental effects?

Shippers		Operators					Terminals		Equipment
									

The pilot study gave us more points than expected and became our framework for further studies and analysis. The identification of the four categories is an efficient way of analysing facts and attitudes, giving the effect of triangulation. The result of the pilot study also correlated with articles and statements from other shipping interests.

The pilot study gives expression of two approaches to the EILU-proposal. One is the criticism of the EILU-proposal, its content and statements. The other is proposals and perspectives how to solve the EILU-problem promoting short sea shipping and reducing road congestion. Following summarised problem identification was derived from the pilot study:

- The EILU-proposal is unsatisfactorily communicated within the shipping industry.
- An EILU is judged to be an intra-EU tool and not able to operate globally.
- Creating one more standard may create operational problems and costs. Stowage problems and lost space onboard vessels are expected, caused by the diversity of containers to be combined onboard. This is judged to increase the shipping cost.
- The calculated potential of an EILU-standard is doubted and asked to be looked into.
- Pallet-wide containers have been on the arena for about 20 years.
- The 45ft container is developed and about to be included in the ISO standard.
- The 45ft pallet-wide high cube is slightly bigger than the proposed long EILU. If EU extends the maximum length on roads from 13.600m to 13.716m (+116mm), there will be an efficient intermodal loading unit based on ISO standardisation workable within the EU.

- Ships design and operational reality is based on the multiple of 20/40ft, which is stackable and possible to combine in the same tier and hold. The 45ft container has its limitations, often put on deck in special positions. A proposal of units with length of 13.60m and 7.82m makes combinations difficult or impossible, and operational aspects very complicated.
- Large units and pallet-wide units are needed for many types of goods, but not all. Some shippers may benefit from an internal width of 2.50m. Large loading units have a great potential of reducing transport costs, referring to the US domestic container and the SECU-box.
- Semi-trailers are known as efficient intermodal loading units, but excluded from the EILU-proposal.
- Feeder operators need to combine global and intra-EU flows of containers onboard the same ship in different combinations. They claim the need of conformity to the ISO standard. Some feel that the EILU-proposal does not promote short sea shipping. The global perspective is frequently repeated as requiring both ships and containers to be operated to, from and within the EU. Standards must be global. If the standard will deserve its term “standard” it must mean that it can work everywhere. The large-scale effect is important to reach low costs.
- The design of ships and cargo units must go hand in hand, both in time and technology, and have a core idea in dimensions, operability and functions. The EILU-proposal does not include details vital for shipping as exact external dimensions and number and positions of corner fittings.

This information and opinions give a broader perspective of possible consequences than the EILU-proposal itself. We can now summarise the two approaches as follows: the criticism of the EILU-proposal concerns the non-conformance to the ISO-container, making the EILU one more box to consider. The proposal should follow the 45ft concept, already implemented and with the same capacity of the long EILU. We notice this for our problem definition.

4.2 The case studies

The general case criterion was an import/export transport where the sea leg is an alternative to other modes, using a 45ft pallet-wide high cube container.

4.2.1 The cargo flows

The cargo represented is low density cargo, attracted to large cubic loading units with pallet-wide width, i.e. losing considerable space if the width is less than 2.40m (multiples of 0.6m). The origin and destination are located within the EU, and therefore defined as intra-EU flows, except the cargo in case number three which was bound for the US.

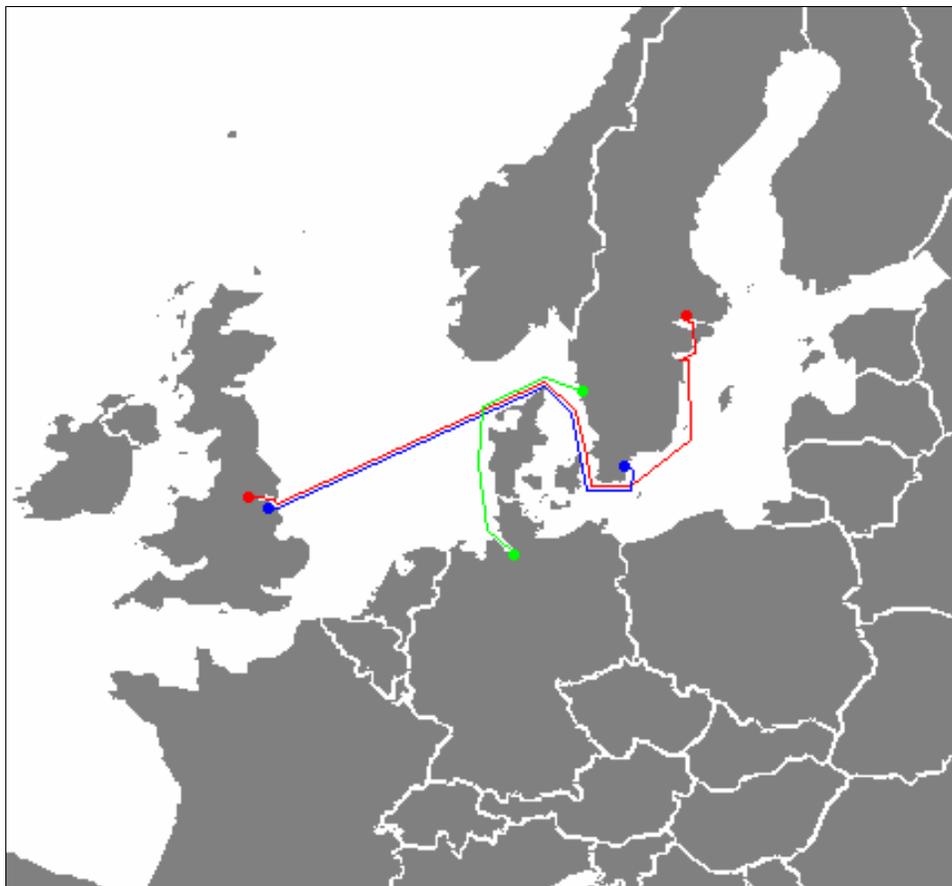


Figure 4.1) Cargo flows in the cases. Source: Hallbjörner/Tyrén, 2004.

4.2.2 The containers

The intermodal loading unit used, is the 45ft pallet-wide high cube container with chamfered fronts¹²⁷. This characteristic of the 45ft unit is close to the proposed long EILU. The findings are translated to the EILU, as defined in the EILU-proposal, and consequences analysed.

¹²⁷ Chamfered fronts – see section 2.1, figure 2.8

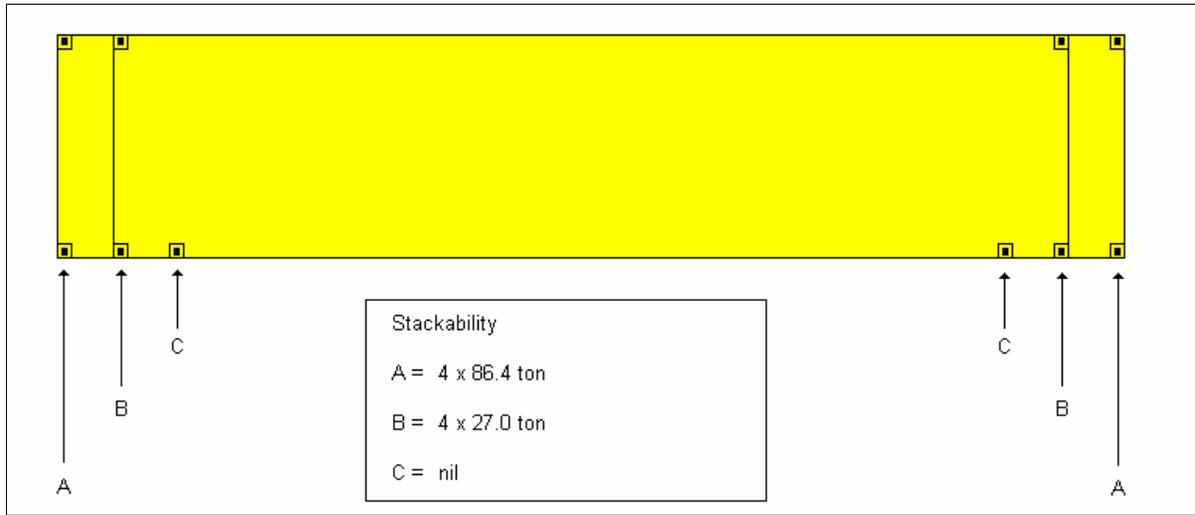


Figure 4.2) Illustration of a 45ft PWHC. Hallbjörner/Tyrén, 2004.

4.2.3 The vessels

The vessels are small and medium size LoLo-vessels, fully container fitted, designed for pallet-wide containers, with positions/fittings for 45ft containers. The cargo arrangement with bays in line with cargo hatches fulfils the requirement for efficient multi-port rotation. The stowage plans below are brought from case number one.

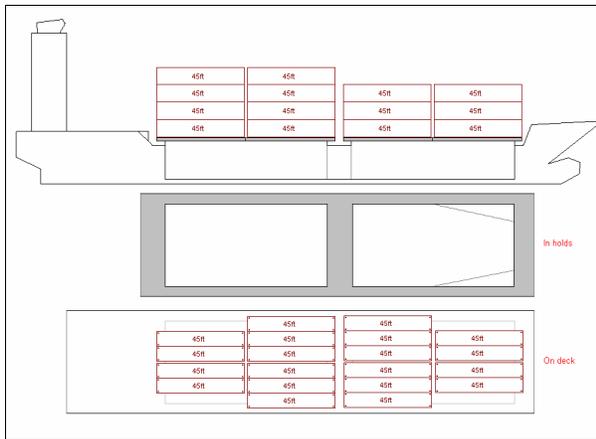


Figure 4.3a) 45ft positions.

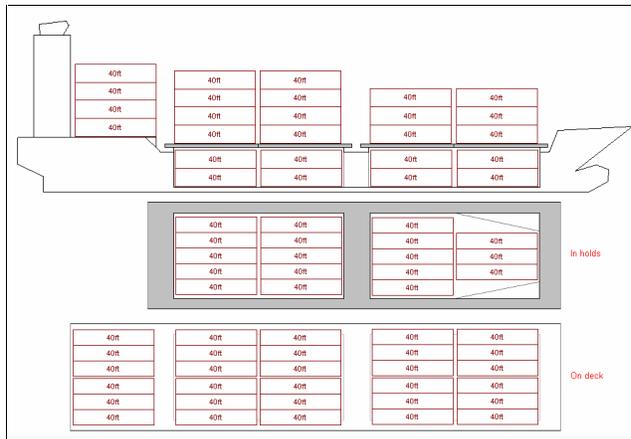


Figure 4.3b) 40ft positions (FEU)

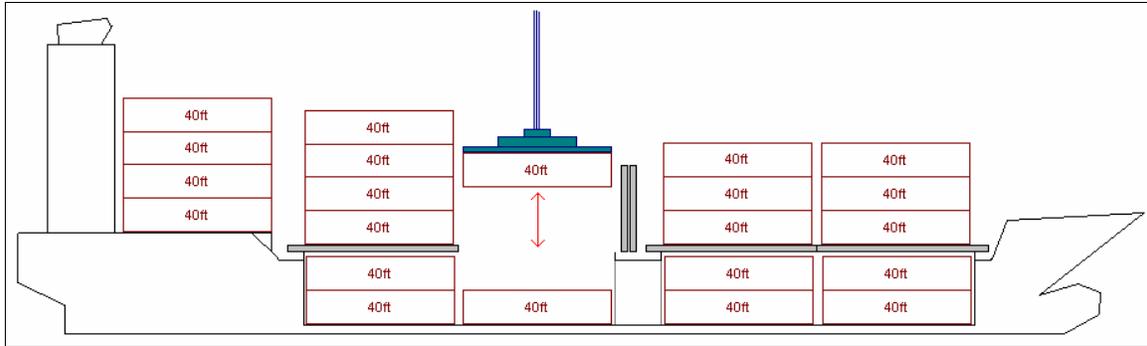


Figure 4.3c) Principle of access. Important in planning for port rotation and stowage avoiding shifting of cargo in ports. Source: Paltrans, edited by Hallbjörner, 2004

The container capacities of the vessels are 304, 202 and 698 TEUs. The two small vessels are non-cellular, using twistlocks for securing containers in the holds, while the holds on the third vessel are fitted with cell guides (cellular). All non-cellular positions on the vessels are dimensioned for pallet-wide containers with an external width of 2.50m.

5 Findings

This chapter reports the findings from our study. The content describes the result from our case studies and models supported by findings in literature, reports and related information. Our focus is directed towards the sea born leg of the intermodal chain.

The overwhelming finding is the difference in perspective. We find that secondary data and the EILU-proposal start from different perspectives in both geography and time. There is a discrepancy in understanding what is good to shipping and which the key facilities to enable improved intermodality are.

	Intra-EU	Global
Today	Minimum investments accepted Still working on the 20ft/40ft footprint leaving overhang in all directions Swap-bodies to be adjusted to shipping Swap-bodies and ISO must use the same fleet of vessels	ISO-containers will continue 45ft units are added Extended cellular width is coming The 45ft and extended width makes the standard “unclean”
Next generation	?	ISO Series 2 Enables standard design of cargo holds Is a “clean” system (half length, strict external dimensions) Need long term implementation Investments covered by life cycle

Figure 5.1) The different perspectives on the intermodal development.

Source: Hallbjörner/Tyrén, 2004

5.1 Findings from secondary sources

The measures taken in the design of an EILU will be affecting the next generation. Which way to proceed in the future? What is promoting short sea shipping best? Most of the feedback to the EILU-proposal is made from the “today” and “global” perspectives.¹²⁸ Some organisations imply the necessity to think globally and the EU to comply with the ISO standards. The swap-body may be adjusted for shipping, being stackable and able to top lift, which will make short sea shipping an option, but will still be handled separate as an “oversize” unit with special restrictions.

From the shipper’s view the characteristics of an intermodal loading unit are ruling the economy of the transport. The internal dimensions and the payload generate the amount of cargo carried in one unit, and may have different effect on different cargo. The density and characteristics of the cargo determine the cubic needed to reach the maximum payload of the unit. High density cargo may reach the payload for a 20ft unit while medium density cargo may need a 40ft container to reach the payload. Light density cargo needs as large volume as possible. The external facilities and strength open up for different intermodal combinations. Based on standards and product

¹²⁸ Ref. Chapter 2.

information from operators and equipment suppliers following list of dry cargo intermodal loading units is composed:

Type of ILU	Payload (ton)	Volume (cbm)	B/E Density (ton/cbm)	EUR-pallets	ton/pallet	Stackable	Top-lift
20ft ISO	28.3	33.3	0.8	11	2.6	X	X
20ft pallet-wide high cube	27.6	38.6	0.7	14	2.0	X	X
Swap-body C745	21.3	44.4	0.5	18	1.2	-	-
Short EILU	27.7	44.1	0.6	18	1.5	X	X
24½ft ISO Series 2CCC	27.7 (?)	49.2	0.6	18	1.5	X	X
40ft ISO high cube	30.1	76.4	0.4	25	1.2	X	X
40ft pallet-wide high cube	30.8	79.6	0.4	30	1.0	X	X
45ft pallet-wide high cube	29.5	89.4	0.3	33	0.9	X	X
Swap-body A1360	29.4	82.5	0.4	33	0.9	-	-
Long EILU	29.2	81.9	0.4	33	0.9	X	X
49ft ISO Series 2AAA	29.0 (?)	99.7	0.3	36	0.8	X	X

Figure 5.2a) Key characteristics of different types of ILUs. Source: Based on the ICF-report¹²⁹

By calculating the “Break Even Density”, i.e. down to which density maximum payload may be reached, the function of the different ILUs is categorised. If the density of a cargo is less than the “B/E Density” the “Volume” restricts the cargo capacity, but if the cargo density is more than the “B/E Density” the “Payload” will be the restriction of cargo capacity. After calculating the cargo intake the intermodal alternatives are investigated and the transport price listed for each ILU. The final transport price per ton or per pallet may then be calculated.

Example) A certain cargo is loaded on EUR-pallets with a weight of 1.0 ton per pallet. The Figure 5.2a shows the density corresponding to the 40ft PWHC. Further investigation in transport alternatives and prices gives the following analysis:

Type of ILU	Payload (ton)	EUR-pallets	Actually loaded	Transport price	Price per pallet
20ft ISO	28.3	11	11	600	55
20ft pallet-wide high cube	27.6	14	14	650	46
Swap-body C745	21.3	18	18	950	53
Short EILU	27.7	18	18	950	53
24½ft ISO Series 2CCC	27.7 (?)	18	18	950	53
40ft ISO high cube	30.1	25	25	1000	40
40ft pallet-wide high cube	30.8	30	30	1050	35
45ft pallet-wide high cube	29.5	33	29	1200	36
Swap-body A1360	29.4	33	29	1350	41
Long EILU	29.2	33	29	1350	41
49ft ISO Series 2AAA	29.0 (?)	36	29	1500	42

Figure 5.2b) Calculation example of transport price per pallet. Source: Hallbjörner, 004

¹²⁹ A more extensive list of dry cargo ILU:s and their characteristics can be studied in the ICF Consulting (2003-10-13), **Economic Analysis of Proposed Standardisation And Harmonisation Requirements**, Belgium – Table 1, page 8-9

The example does not say that the ILU matching the density of cargo is the most efficient, but shows the factors involved. The transport price used in the example is fabricated and used purely for this illustration of the model. The transport price is strictly individual, being changed over time and offered in competition on a transport market. Based on this, our case studies do not investigate the transport price, but focus only on consequences when using the 45ft PWHC as an approximation of the long EILU.

The EILU-proposal does not specify the occurrence of overhang. When the 20ft/40ft footprint is provided it leaves an overhang both longitudinally and transversally. We find arguments about the stowage problem, but still no technical and operational specifications inside the EILU-proposal. The existing 45ft container gives a lot of input on this, resulting in 12 bottom fittings to be fully operational for shipping.

The variety in unit types and dimensions is becoming a problem for ship designers. How to specify requirements for a cargo hold/hatch design, an investment for 25-35 years, working on a global shipping market? Specifying compliance to numerous of container standard leaves the problem of operational aspects to the designer and ship owner. If the standards are not compatible, the designer and ship owner have to choose, and of course they choose the global ISO-standard. Our study therefore goes back on the theory and connects technical details to operational aspects. Different aspects are found due to ship type, i.e. RoRo- or LoLo-vessel.¹³⁰

The RoRo-concept needs an additional tool (rolltrailer or cassette) to carry the intermodal loading unit. The rolltrailer/cassette must to be accessible close to the front for connection with a terminal tractor (tugmaster). The lane width is often dimensioned for semi-trailers and the transversal overhang of the intermodal loading unit is therefore not a problem. The RoRo-concept was chosen by the IPSI-project¹³¹, as they see it as an open system. 40ft rolltrailers/cassettes are most frequent and therefore benefit from fittings placed as Figure 5.3 shows. If the EILU only equips with 40 distance fitting symmetrically placed, additional equipment must be available.

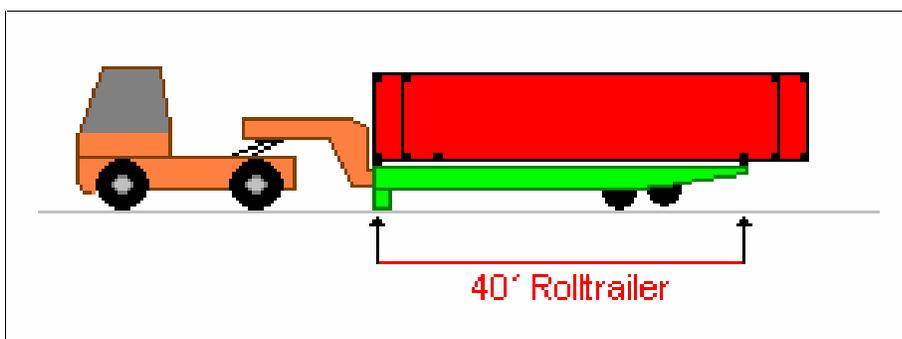


Figure 5.3) A 45ft container put on a rolltrailer. Source: Hallbjörner, 2004.

¹³⁰ Ref. Chapter 2, Section 2.1

¹³¹ Hamworthy KSE AB et al (1999), "Improved Port/Ship Interface – Final report for publication", Contract No WA-95-SC.140

The LoLo-concept must not be excluded. The LoLo-vessels are known to be more cost efficient and able to be operated in all sizes. The intermodal development has to consider the operational aspects here. The operational aspects are the need of great stackability, distinguished external structure, giving full access to the corner fittings for twist locks and rods, as well as being supported by cell guides. Intermodal loading units without these qualifications may be stowed on LoLo-ships but only in certain positions giving added restrictions for stowage planning. So far, modifications in design, e.g. widening the distance between container positions, have solved the problem of pallet-wide containers, as they still are in minority. But the more frequent containers swelling outside the 20ft/40ftx8ft frame we moves closer to a new generation of ships and containers.

Adjustable cell guides, increased space around each container position, special twistlocks, and related ideas are numerous. Technical innovations may always be possible, but result in investments, manual and hazardous operations, and planning complexity.

We have not found any technical reasons for not adopting the 45ft pallet-wide container instead of creating a long EILU. We found the discrepancy of 116 mm of great importance in the choice of perspective, making difference regarding the consequences. The 45ft container (square front), has distinct external dimensions, corner fitting in the ends (45ft distance), giving operational compliance with the LoLo-concept. Using the 45ft distance fittings, full stackability is reached. We also find many ships designed with on-deck-positions dedicated for these 45ft units.

5.2 Findings from case studies and models

Our findings from our case studies and models are, in the perspective of today, in short:

- An EILU may only be profitable to shipping if it is rarely used and then works as a complement to the ISO-containers.
- The EILU-proposal is not fully specified to foresee all consequences.
- The EILU-proposal leaves cargo hold design and ship operations criteria unspecified.
- The 45ft pallet-wide container does the same job as the long EILU.
- The function of the short EILU is not found logical to ship operators.
- A win-win situation for both shippers and operators must be created.

The EILU as a complement only

Due to the fact that the EILU may only be working in certain positions onboard, i.e. on deck where the overhang doesn't intrude on other positions, makes it profitable for the ship operator up to a certain mix. This is strictly depending on space available around the container positions. As soon as we loose one position, the benefit is lost on a fully booked ship. Figure 5.3 and 5.4 shows the shipping cost¹³² per pallet position, where the 45ft container may be stowed so that it does not intrude upon close spaces, but where the EILU with its overhang intrudes upon the

¹³² Costs for cargo handling excluded.

position fore or aft. Figure 5.4 illustrates that the mix may be profitable up to a mix of max 50% of the 45ft containers, while Figure 5.5 shows that the long EILU never results in cost savings.¹³³

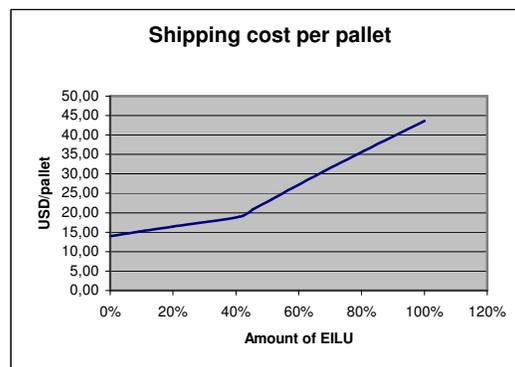
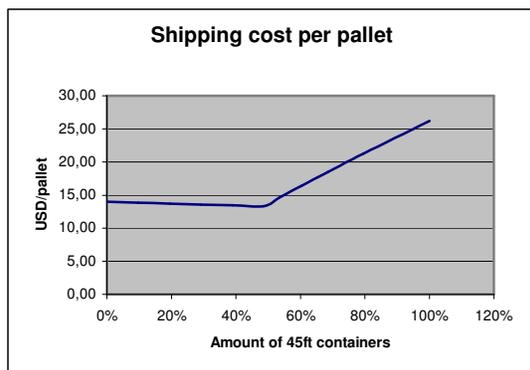


Figure 5.4) The effect using 45ft pallet-wide containers. Source: Hallbjörner, 2004.

Figure 5.5) The effect using long EILUs. Source: Hallbjörner, 2004.

This is what we define as an “unclean” solution, meaning that the standard itself, without combination with the old ones, cannot create increased utility and lowered costs. This finding is supported by the “BIC-report” saying that the EILU would not raise maritime carrying issues, unless the unit reaches a market penetration of above 25%.¹³⁴ In that case the positions where overhang does not intrude upon other positions are 25% of the ship. In our case we may offer about 50% of the positions to 45ft containers, and about 25% of the positions to the EILU, if the overhang is symmetrical.

Full specification of the EILU

Taking the above findings into account it is obvious that the details of importance to shipping are not defined. Such details are the exact external dimensions and the number and position of the corner fittings. Our case studies use the 45ft pallet-wide container as a substitute, from which we derive our findings and relevant conclusions to the EILU. In our study we have assumed that the EILU is following the recommendations in the UTI-Norm report, leaving overhang symmetrically fore and aft.¹³⁵ This overhang is calculated to be 0.7m each end. This makes operational difference between the two units, as described in Figure 5.6.

¹³³ Ref. Appendix III

¹³⁴ Ref. page 20, (Technical study on the harmonisation and standardisation of intermodal loading units.)

¹³⁵ Ref. page 18. (UTI-Norm Report)

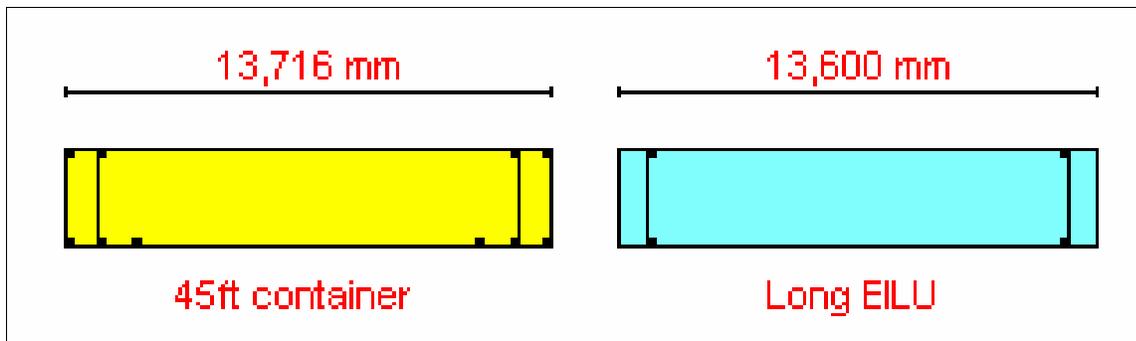


Figure 5.6) Possible difference between the 45ft container and the long EILU. Side view showing positions of corner fittings and the external length. Source: Hallbjörner, 2004.

The situation is the same regarding the width. Due to the presence of the pallet-wide (2.5m) containers, many ship designs are adjusted, so the transverse distance between the twistlocks (in non cellular areas) allows such overhang, see Figure 5.7. If the EILU goes further to 2.55m there will be further restrictions to the EILU, still looking from a “today” perspective. We have assumed the width of 2.50m in our case studies, to make it similar to the pallet-wide containers.

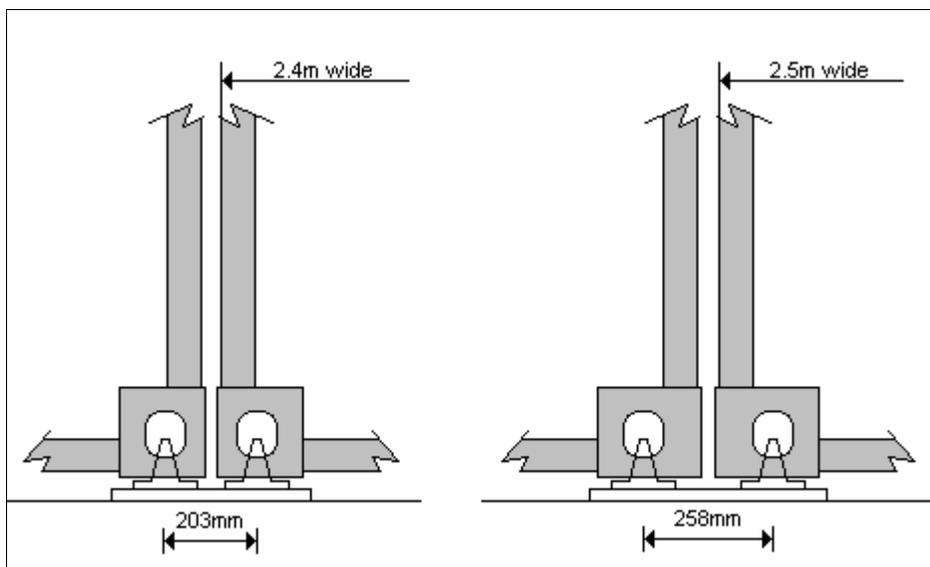


Figure 5.7) The normal transverse distance between container fittings. Transverse section. Source: Hallbjörner, based on information from www.sec-bremen.de (2004-07-06)

Cargo hold design and ship operation criteria

As the EILU-proposal does not fully specifies details needed for shipping, the proposal cannot result in recommendations of cargo hold design or ship operation criteria. We find it crucial to take these into account, and so make it possible to formulate guidelines to the ship design industry, today only working with the IMO standard. It is urgent that these guidelines are well communicated in order to give a chance of making next generation of ships able to benefit from a new container standard. If not, the new intermodal loading units would only cause increased costs, and most probably be charged accordingly.

The guidelines should include:

- Minimum transversal space between container fittings
- Minimum longitudinal space between container fittings
- Point loads as a function of stacking height available
- Procedures for handling and securing of containers, including twistlocks and rods, enabling efficient cargo planning with minimum restrictions

The main focus must be multiples determining the position of the bulkheads and cargo hold sides. The longitudinally space has to consider passage of crew and stevedores, for inspection lashing, unlashng, operation of temperature units, etc. However we doubt that the best way to go is via CEN. We favour to work closely with ISO in the “next generation” perspective. Also the prevailing 45ft unit, with 12 bottom fittings, makes a huge difference to the arrangement, with which the long EILU should comply.

A sketch based on material made by Jadwiga Igielska in October 1997, guiding us (7 years ago) where to put the bulkheads (length of vessel sections) in order to be prepared for the next generation of containers, communicates a vision of a possible implementation process.

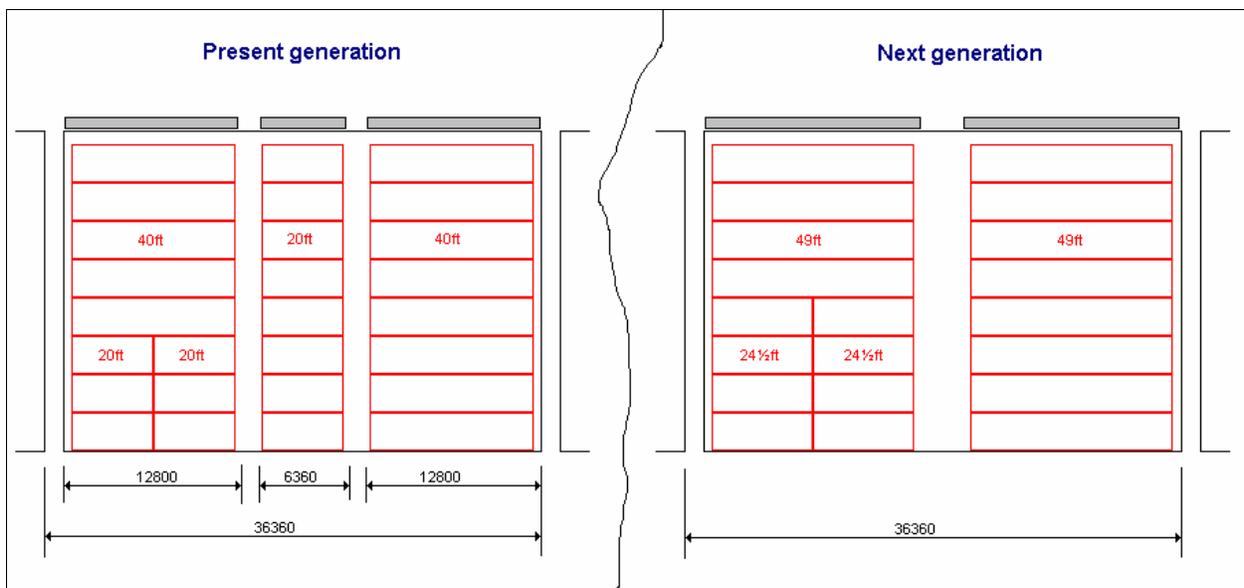


Figure 5.8) Hold arrangement for future adjustments to new generations of containers. Source: Based on Jadwiga Igielska, 1997¹³⁶.

Following series of illustrations shows the effect caused by one of the details of importance, namely the longitudinal distance between the 40ft positions, below called “S”. There are other distances of importance, e.g. the above mentioned transversal distance between fittings, distances to bulkheads and the required space for passage ways and arrangement of securing. The example below concerns a modern vessel with a pallet-wide arrangement with 45ft positions on deck. Space less than 0.7m gives a worse case situation. It does not give the EILU any potential of increased utility of the vessel.

¹³⁶ Igielska, Jadwiga (1997), **Container Carriers – Operational Aspects**, Chalmers University of technology, Göteborg – Fig. 6.

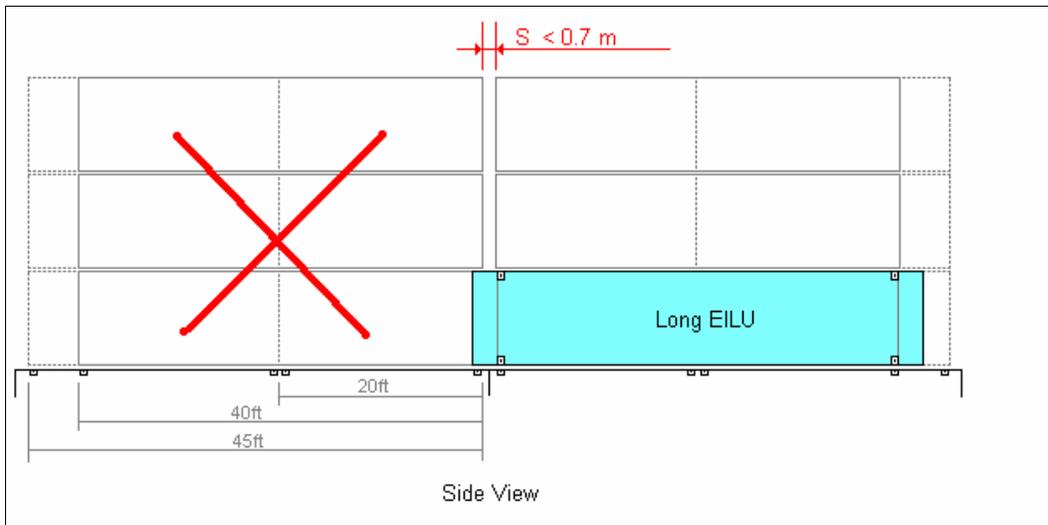


Figure 5.9a) On deck arrangement. Space, $S < 0.7\text{m}$. Source: Hallbjörner, 2004.

Space between 0.7 - 1.4m gives the medium situation, giving the EILU a potential of increased utility, if representing less than 25% of the cargo mix. The rest of the cargo has to be ISO containers.

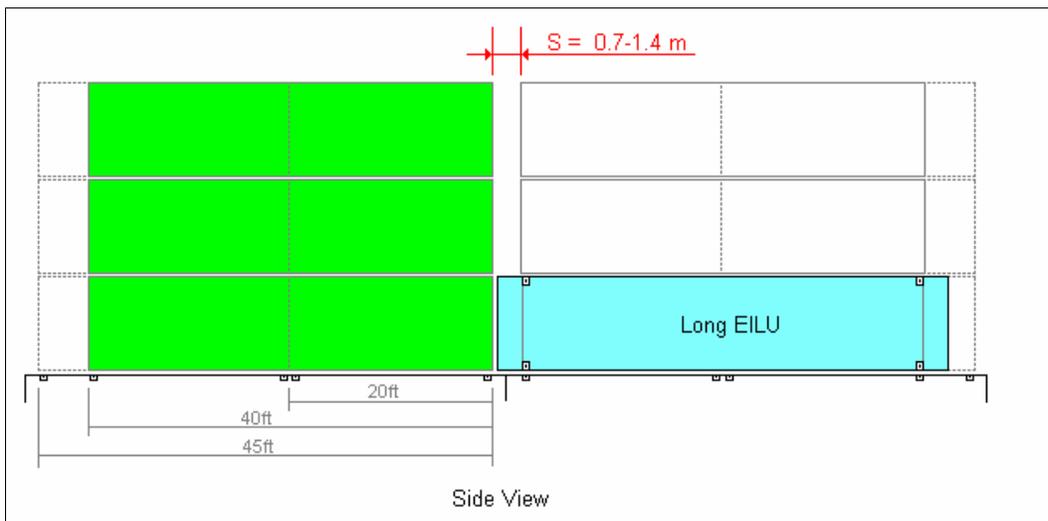


Figure 5.9b) On deck arrangement. Space, $S = 0.7-1.4\text{m}$. Source: Hallbjörner, 2004.

Space more than 1.4m gives the same potential as the 45ft container of increased utility.

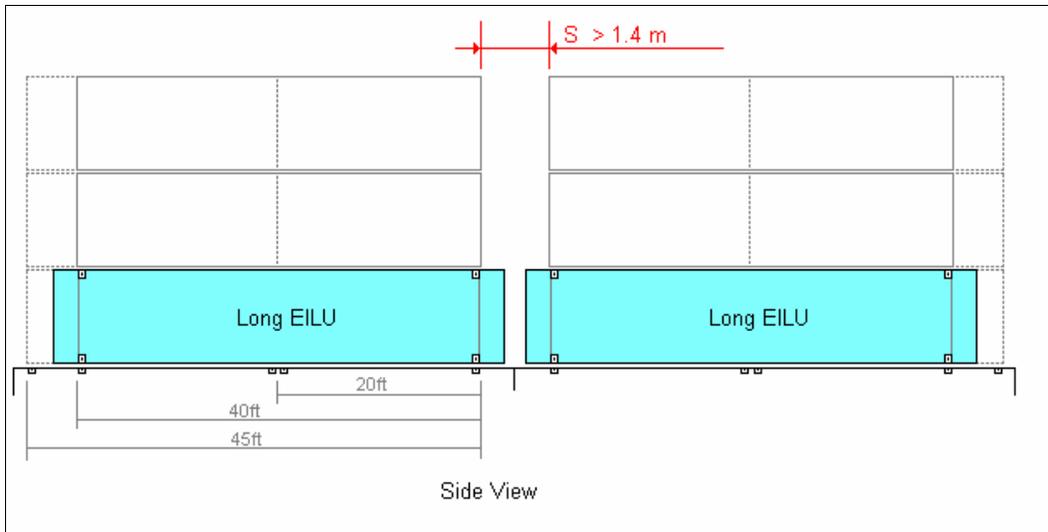


Figure 5.9c) On deck arrangement. Space, $S > 1.4m$. Source: Hallbjörner, 2004.

Looking at the short EILU the findings are similar but with the difference that the short EILU always will need 40ft space and is not combinable with any other units than the 20ft ISO container. Not even with the long EILU, one of its own family.

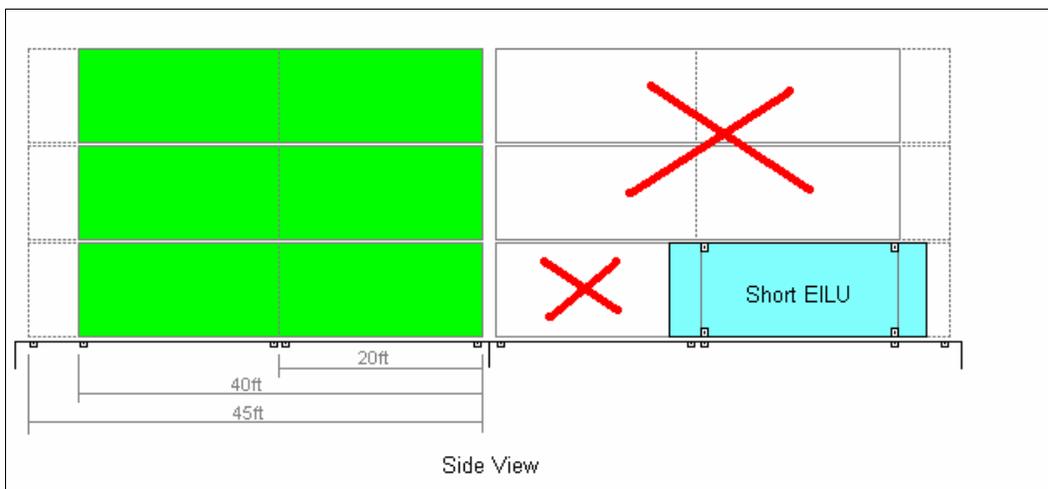


Figure 5.9d) On deck arrangement. The Short EILU. Source: Hallbjörner, 2004.

Our cases show that operational aspects in cargo planning are vital. The rotation of the ship between ports decides where to put different units, so they don't block cargo from being discharged in subsequent ports. All additional restrictions, i.e. dangerous classification, oversize units, reefer units, etc. complicate the situation and very often means additional costs or lost space. Here again we find the benefits of what we call a "clean" solution with a unit that goes *inside* a given frame where the short unit is half length of the long one, which makes them combinable.

The 45ft pallet-wide container

Our findings are that the 45ft pallet-wide container will be on the scene even if the EILU should be implemented. The both units have the same pallet capacity. The 45ft length is more global,

even if it is considered by us as an “unclean” half way solution. The 45ft unit has also resulted in the adoption of the corresponding footprint in certain positions on deck, making it more shipping friendly and fully stackable.¹³⁷

The function of the short EILU

All findings regarding possible consequences of the long EILU, as described above, concern the short EILU. The external length may be 7.45 or 7.82m. If using the 7.45m length, the unit is remarkable close to the ISO Series 2, short container. If using the 7.82m length, the longitudinally overhang from the corner fittings, is bigger than for the long EILU. Thus we find the short EILU to be more difficult to deal with.

The function of the short EILU is found doubtful. Our case studies show that the mix of 20ft and 40ft containers efficiently meets the needs for high and medium density cargoes without considering possible benefits in road vehicle combinations. Our findings here may be developed and analysed further.

A win-win situation for both shippers and operators

The last big and vital finding is the way of implementation. The EILU-proposal leaves the task to the actors to “discover its benefits”.¹³⁸ From our case studies we learn that the price per ton or per pallet is the ruling factor for shippers, while the ship operators must gain operational benefits in time and utilisation of the vessel.

The pallet-wide container has been on the market for a long time, attracting a certain type of cargo. The 45ft pallet-wide container is chosen in case the shipper has use of the extra space, offering a transport price per ton or per pallet which is slightly lower than for a shorter loading unit, but giving the ship operator a slightly higher income for the container position used onboard¹³⁹. If the density of cargo is big enough to reach the max payload of 30 tons using a 40ft unit, the 45ft unit is not of any benefit to the shipper, and he will not pay more for the 45ft unit. Asking the question if an EILU (the swap-body and the ISO container still available) would promote short sea shipping, the answer was negative. The mechanism in finding a win-win situation would be similar to the situation of today. Ship operators investing in containers would most probably hesitate to investigate in a unit type not fully compatible with the ISO development.

In intermodal transports the co-operation between ship operators and road haulers are vital. The road haulers in our cases are subcontractors to the ship operator. Therefore we find the ship operator sitting with the promoting and strategy problems, being charged the same road transfer cost despite the type of unit. He does not see the aim of the EILU-proposal. Instead he requests full acceptance of the 45ft standard (with square front) on EU roads.

¹³⁷ Ref. Appendix II) Case Report 1

¹³⁸ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), “Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units” – Section 6.2, item 24.

¹³⁹ Ref. Appendix II) Case Report 1

6 Conclusions

In this chapter we make our conclusions based on our findings and give some feedback to the EILU-proposal and the work of developing modern containers. There is no doubt that we need larger and better containers, but the question is how to proceed. The various consequences are of different significance to the actors in the intermodal transport chain. Finally we take the opportunity to communicate some recommendations based on reflections we made during our study.

Generally no one questions the purpose of using bigger and more efficient intermodal loading units. The presence of a standard is vital to make intermodality possible. The EILU-proposal is derived from the problem that the swap-body is not welcome in ports and onboard ships, this mainly because it can't be top lifted or stacked.

6.1 Possible consequences of the EILU

Our conclusions are that possible consequences of an EILU will be:

- **Another intermodal loading unit**, making further restrictions for operators to consider, offering a choice beside swap-bodies, semi-trailers, ISO-containers and pallet-wide versions of the ISO-container. The EILU will be another “unclean” solution swelling outside the 20ft/40ft corner fittings, possibly being mixed up with the similar 45ft pallet-wide container.
- The EILU together with other similar units generates a **win-win situation to some shippers and operators**, but only in case it is a complement to the ISO standard, and in case the overhang outside the fittings doesn't intrude upon other container positions onboard.
- **Possible segregation between global and intra-EU flows**. A risk of increased flows of empty units, as ISO containers will be rotating inside the EU as well. The grey box concept idea is then moving backwards.
- A risk of **EU moving in its own direction** in the intermodal development, creating barriers and complication to the global work within the ISO, and in worst case blocking the border not allowing for example the 45ft container on EU roads, with the message “we use our own EILU here”.
- A risk of **increased costs for ship operators** as the EILU might cause lost space onboard. This is not only generated by physical restrictions, but also by the mix of cargo units to be carried onboard on the same voyage. There will also be shifting costs generated by special positions for certain types of units.

- **Future vessel design** to consider the mix of loading units and extra space needed for EILUs, in order to be optimised for maximum cargo intake.
- The presence of **another standard to be considered in ship design**, beside the ISO standard, with a different operational principle and requiring different space between the fittings, makes the interpretation and knowledge vital. It may cause restrictions to ship operators if they have to employ ships in different trading patterns. A second standard for intermodal loading units will most probably have a negative effect on the design of the “standard container vessel”.
- Preserving **manual stowage and securing** onboard (twistlocks etc), with loss in time and safety, unless the EILU will be developed towards the ISO containers.
- Another possible consequence of the proposal is that it does **not lead to any change**. The standard might not be used, due to similar units available, and with no economical subsidies to manufacturing or to transport costs. Road haulers investing in units might not see the benefit in adding extra costs for facilities they don't have any use of. Ship operators invest in equipment for a global market, based on the ISO standard, today already in production, and adopted to the stowage arrangement onboard

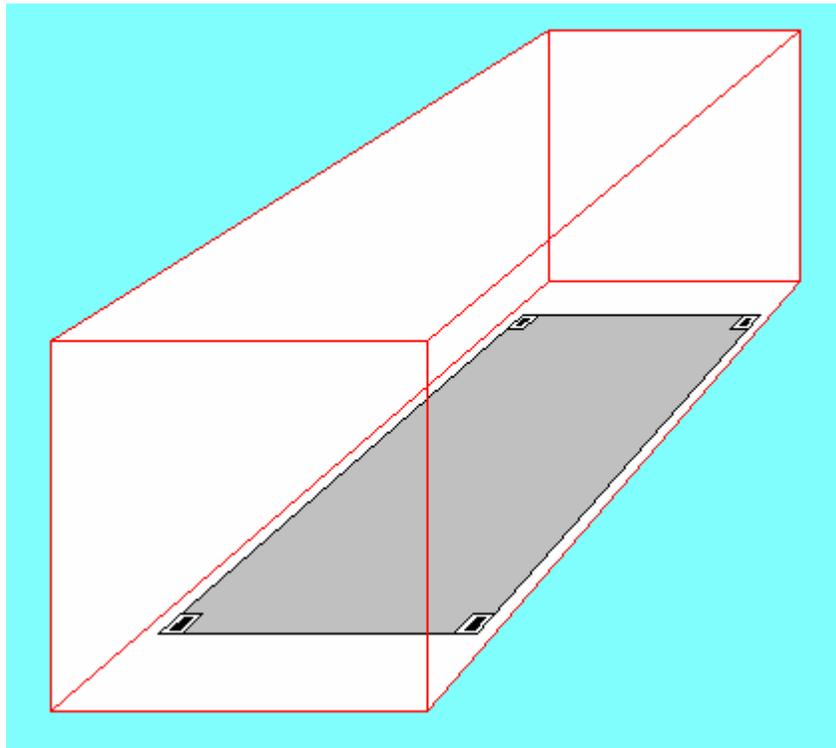


Figure 6.1) The overhang problem. Source: Hallbjörner/Tyrén, 2004

6.2 Criticism of the EILU-proposal

We have met a lot of criticism of the EILU proposal during our study. We have mentioned some and we have the ambition to highlight a few of what we consider serious mistakes.

The semi-trailer is excluded from the EILU discussion¹⁴⁰, in spite of the fact that it is a huge player in European intermodal transports and competes with other intermodal loading units. If the development of semi-trailers is not co-ordinated there will be a risk of adjusting small margins in contrary directions. One example is the 116 mm in difference between the EN A1360 and the ISO 45ft length. Another may be the width, for non-insulated units 2.55m and for ISO 2.59-2.60m in the future. We also find features of inner height of 3.0m to be very interesting to some shippers, which the semi-trailer manufacturer may be able to meet, however not met by the ISO so far. Making decisions in an EU perspective, not considering the semi-trailer, would create sub-optimal barriers for global intermodal development.

The declaration of a **potential reducing the number of road vehicles being 25%** is not proven. The figure of 25% is used as a selling argument in benefit for the EILU-proposal. The method in calculating the number of EILUs needed to cover the same pallet capacity as the world fleet of ISO containers cannot be left without criticism. The comparison is not relevant to EU, where the pallet-wide container has been available for many years, the semi-trailer is still running, the swap-body is still being used on roads and the ISO-containers arriving from other continents are still being transferred to their final destinations. The declaration makes the EILU-proposal look unscientific and should be withdrawn.

The EILU-proposal leaves for shipping **important technical and operational details** undefined. This makes the proposal unsatisfactorily communicated within the shipping industry. The possible alternative with pallet-wide versions of the ISO container is left without consideration. The prevailing swap-body standard (EN 452) might be amended to be more shipping friendly, and in such way makes short sea shipping an intermodal option to choose, but adding one more EU-standard. The necessary combination of EILUs and ISO-containers in the same system is mentioned neither from marketing nor from implementation point of view.

We do not find the EILU-proposal, in its original version, being an overwhelmingly positive revolution and an obvious advantage to short sea promotion as it leaves questions in mixing intra-EU flows with global ones. The EILU-proposal goes only half way, offering an “unclean” system with dimensions not optimised for the future, and too close to the today’s swap-body standard.

¹⁴⁰ Brussels, 2003-04-07, COM(2003) 155 final, 2003/0056 (COD), “Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Intermodal Loading Units” - Introduction

6.3 Recommendations

All reports and papers concerning the EILU-proposal give recommendations, based on different positions and standings, and so do we. We would like to make them in perspectives of time.

Present generation:

Promote short sea shipping by supporting the pallet-wide version of the 20ft-, 40ft- and 45ft container, where the shippers and ship operators may benefit both from the larger volume and pallet capacity is still fully compatible with the ISO standard frame offering all other commodities to be transported inside (liquids, bulk, heavy cargo, etc.).

As a first step increase the road restrictions from 13.600m to 13.716m allowing the 45ft square front container within the EU. This would be a large step towards globalisation without any cost in infrastructure or equipment.

Continue the development of the prevailing swap-body standard (EN452) to be more shipping friendly, by being possible to top lift, made stackable and with additional bottom fittings, making short sea shipping an intermodal alternative, i.e. for RoRo operators enabling smooth handling between road vehicles and roll-trailers. One or another marine swap-body may be attractive to LoLo operators, but most probably not as the main solution.

Next generation:

Make Europe the leading force towards globalisation. Nothing is more global than shipping and intermodalism. The ISO Series 2 is considered as a “clean” solution to shipping but is a huge step to take. After a necessary period of preparation to ships, ports and infrastructure, it will become a modern global intermodal tool. We find the dimensions proposed excellent, and relevant, but understanding the fear of introducing the length of 14.90m in Europe.

- Long, 49ft: 14.90 x 2.60 x 2.90 (LxWxH)
- Short, 24½ft: 7.43 x 2.60 x 2.90 (LxWxH)

The long term perspective must be raised, with a huge emphasis on the implementation process, widely communicated to the shipping industry. We would not like to put up any year for implementation, but we recommend the ISO to complement the ISO Series 2 by creating technical and operational specifications/guidelines for designing holds and hatches of ships. The bulkheads and structural part of vessels and equipment are to be prepared for the future, via small modifications gradually accommodating the new generation of containers, if found profitable and efficient by the market actors between Europe, USA and Asia.

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Appendix I) The pilot study

We asked nine open questions to four categories of actors involved in intermodal transports to and from Sweden. This pilot study was a part our problem identification which led us towards what to investigate and why.

The respondents

The respondents are in Swedish well known people active in one of the four categories in the shipping segment:

1. Shippers (transport buyers)
2. Operators (line operators, ship owners, transporters)
3. Terminals (ports)
4. Equipment (equipment builders, designers, leasing and/or suppliers)

The criterion to be listed in our frame was to be documented in any development project of an intermodal transport chain. From this frame of population we randomly brought out 10 respondents for a telephone interview. We asked them to comment nine open questions.

The result

Analysing the answers we illustrate our interpretations by following principle:

	“positive” - “very good” - “no objections” – “yes”
	“partly positive” - “quite good but with some objections” - “on the right track but not perfect”
	“neutral” - “have no opinion”
	“cannot agree but there are a few points” – “quite negative”
	“negative” – “totally wrong” – “no”

The questions and the results are described as follow:

1. Are you aware of the proposal of a new standard for cargo containers, the European Intermodal Loading Unit, EILU?

Shippers		Operators					Terminals		Equipment
									

Result: 40% of our specialists were aware of the proposal of the EILU. We were surprised over this lack of knowledge. This might be a problem in itself. Is the EILU-proposal unsatisfactorily promoted within the shipping sector? May be our work has a role in spreading the information? This fact very much influenced our choice of method.

2. What is your reaction to this proposal?

Shippers		Operators					Terminals		Equipment
									

“Negative. Difficult to operate on ships and in ports. Expensive to maintain and buy.“

“It sounds really crazy and need a more detailed inquire in order to examine the intermodal transport needs.”

“I’m surprised. Why a European standard? We already use the 45-foot-pallet-wide ISO-container. To me the 45ft-unit looks even bigger than the EILU.“

“The container cannot be shipped with today’s ship fleet. It does not fit in the existing cell guide system. This is vital for effective shipping. They can only be shipped on deck today and this is not enough. We already have problems with different sizes of tank containers. Here there are many varieties. There are no margins for a 42’ container. The ships are built for 20 and 40’ containers only. Especially under deck. If we get a 45’, we normally put it in the second tier on the hatch. They cannot ship under deck. Some ships can take 45’ in a couple of bays. New ships can take 45’ in all bays on deck.”

“In general positive. X is positive to increase the size, payload and to gain side access to the loading units. X has been working with 45-foot-containers in order to optimize the distribution. X very seldom use swap-bodies, often too expensive. X uses standard pallets but not for all products. Many of their products do not fit standard pallets. The goal (not yet reached) is to use a

45-foot pallet-wide, stackable, container with access from side, at cost of about the same as an ISO-container. Today the container has to be stripped before reaching the customer, as they cannot discharge the container from the short side.“

“You have to work together with the IMO and find a way *together* with the shipping companies.”

Result: Their reaction was not quite positive. The shippers like bigger units and are in general positive to changes but are not so concerned about the consequences for the ship operators. The shippers expect lower transport costs. Regarding technical details they find the internal height to be of vital importance, as well as the possibility to access via the long side.

The ship operators are very negative to the proposal. They think the EILU will be another one/two types of boxes to handle. It means that the stowage planning will be more complicated and there will be problem in combining intra-EU and international cargo flows. Different problems will occur depending on which line operates LoLo- or RoRo-ships. To be able to offer cost efficient solutions the ship operators need a “grey-box” concept so there will be as few restrictions and factors to take into consideration. The situation is complex as it is today. Further restrictions in size, possible stowage positions, non-compatibility in stowage together with other units, etc are expected to increase costs. Many of the ship operators also describe the semi-trailer as a big player and must be included in an intermodal study.

The terminals like to be neutral and open for all kind of units. But asking about stowage in terminal area we understand that the multiples of a measure are a benefit in order to use the stowage area effectively.

The equipment suppliers have an international perspective. They feel the EILU-proposal restricts the use and market for their product which makes it more expensive. According to their and the opinion of the operators there are already containers in the market filling the needs that the EILU is meant to meet.

3. What problem/questions would you like us to investigate?

Height – Why not a height of 2.90m?
Width – Why not a width of 2.60m?
Length – Why not a length of 45ft?
Payload – What payload will be offered?
Stowage – How to stow these units onboard vessels?
Potential – Is the potential as great as implied?

“How much space will be lost in cell ships?”

“Mainly the suitability of the below mentioned container onboard a couple of standard intermodal vessels.”

“Its potential for improving utilization.”

“I hope that the EILU does not succeed, we prefer trailers. Trailers impose minimal costs for handling equipment. A specialised container like the EILU may have a low 2nd hand value on the market because it has a limited usage area (i e Europe).”

“Today there is a well established container standard, ISO, in force. Can a new standard really be feasible?”

Result: The respondents liked us to highlight the practical aspects important for the shipping leg. They liked us to investigate why not the 45-foot container is accepted as the “long EILU”. The respondents frequently asked about the height. Why is it so low? Also the stowage problems are vital, as the EILU will be incompatible with other containers. The “half-length”-problem is one big factor making the stowage issue even worse.

The width of minimum 2.42m was confirmed as an important factor for all kind of cargo, not only palletised cargo. In the long perspective one shipper asked for 2.50m inner width as we most likely can accept 2.60m external width on roads in the future. All respondents like to know more about the payload. Stackability and top lift facilities cost weight and money. May an expensive EILU have the potential as implied in the EILU-proposal? Many of our respondents doubt that.

4. Do you interpret the EILU to be of world-wide use or only an intra-EU tool?



Intra-EU only!

“I can’t see how the world outside EU have any interest to use these boxes.”

“Despite this fact one must remember that short sea shipping also is feeder for ocean trade. Ocean vessels offers increased cubic via highcubes. Short sea vessels mix ocean and short sea by putting the 45-feet on deck. So far the vessels holds are not fitted for 45-feet-units.“

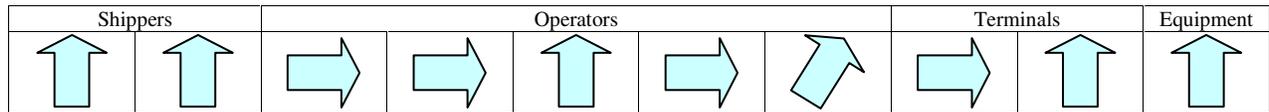
“The container cannot be used outside of EU. It is not good to have an intra-EU system and one WW system. I doubt the EILU will succeed.”

“Today it would only work within the EU but if it is to be a success, it needs to go worldwide, beyond the EU.”

Result: All of the respondents consider the EILU to be an intra-EU tool. They claim this to be a disadvantage and prefer a more global standardisation. The shippers, in general positive, state the global standard to be a vital factor in getting cost efficient transports. The ship operators must be

able to have a sort of standard cargo hold design. Ships must be able to be employed in all parts of the world.

5. The main argument is said to make better use of the capacity for transporting standard pallets (page 8). What is your comment to this?



“Yes, and also with possible side access. I think the total concept need to look at how it can be operated and what possibilities to do the same work with a “Standard” pallet-wide CPC in cells, also for overseas. “

“Yes, it is important to offer pallet-wide units. This caused of the competition from semi-trailers. UK-Sweden is judged to consist of “almost only” standard pallets. Very few containers reach the payload. High cubic is required.”

“A strong down to earth argument.”

“Good, but even if X do not use so many standard pallets, the inside width is important to increase.”

“The Eur-pallets is a small factor only. The main thing is the capacity in cubic meters. That is what counts.”

Result: The proposal of the EILU focuses on standard pallets. Our specialists agree that the width is important, but also states that there are many other types of cargo that need a large width. We also noted that many customers want the possibility to load the unit from the long side. Some receivers cannot discharge the container from the rear side, so the cargo must be transferred to another vehicle before reaching the end destination.

In general the total inner cubic, length, width and height, is in focus for general cargo. An increased unit size is confirmed to be a potential for more cost efficient transports.

A parallel to the SECU¹⁴¹-box was made. Even if the SECU is unit in a closed system, it shows how important the size may be. This respondent makes the conclusion that StoraEnso must save a lot of money in transport cost to be able to invest big money in own containers.

¹⁴¹ Stora Enso Cargo Unit

6. Another statement is that Europe needs an optimal intermodal loading unit that combines the benefits of containers and swap-bodies (page 3). What is your comment to this?

Shippers		Operators					Terminals		Equipment
									

“Yes, good idea, but again look at possibilities to operate standard pallet-wide CPCs.”

“Yes, if it generates positive large-scale effects. If the EILU will be a “third” type of unit, the effect might be unfavourable.”

“A swap-body cannot be stacked. It is doubtful if the EILU can replace the swap-body. It would be more wise to treat heavy and non-heavy cargo separately. They are different and require different handling.”

“You shall not separate Europe from the world. Make them work together with the same equipment.”

Result: The proposal of the EILU is dealing with the task to make one unit out of the swap-body and the ISO-container. Many of our respondents do not fully understand this approach. One respondent reacts on the EILU to be a bad combination of the two unit types (ISO and Swap). Another respondent likes the idea if it will create large scale effects but fears the contrary result, making three units out of two. Some think the mission is impossible as the swap-body idea is to be non-stackable in order to be light and have a low tara and large cubic. In discussing this item the global perspective was repeated.

7. Do you think the sizes (long and short EILUs) and measurements (height, beam, etc) of the EILU are relevant?

Shippers		Operators					Terminals		Equipment
									

“It might be some cargo for this but in order to optimize the total freight costs we need to minimize the number of different types.”

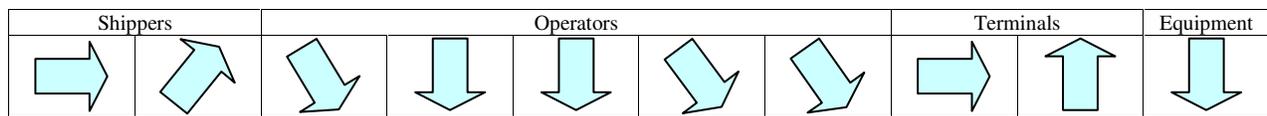
“May be, but the effect must promote the short sea concept. X think that the road and rail have their limitations of capacity and the short sea systems have to be used. Therefore the tools must fit at sea. But increased capacity of each unit is necessary to reduce the number of trucks on the roads. The height must be increased.”

Result: The dimensions of the EILU are derived from several restrictions within the EU. Many of our respondents have the opinion that the height is too low. “High Cubes” are what the market demands. Also the length of the unit is criticised. Why not go for the 45 feet length? (another 12 cm). Why not increase the width to 2.60 m?

The external length of the two EILUs (13.60m and 7.82m) are criticised as the “half-length” problem. The EILU-proposal makes it impossible to combine these two sizes in the same stow (tier), which creates one more factor (restriction). Restrictions must be eliminated as much as possible, they say. This is also the problem with the 45-foot container.

Compatibility to the prevailing cell guides in cellular container vessels is a critical question. Some operators claim the necessity of this as cell guides create a fast and cost efficient system, but need standardisation. A standard is asked to support such facilities. This wish compete with the wish to increase the internal width beyond 2.42m.

8. Is there a need for a new container standard? Is there a need for an EILU?



“A better study needs to be done to find out the different cargoes and loading possibilities inland. It may be other things to focus on. Other facilities for loading and discharging containers may be more efficient than change the container? Study “common” cargoes other than forest products and steel (always require special solutions) – may give another picture of needs.”

“No. Please note the benefit to keep within the ISO. Please also note the mix of feeder/ocean and short sea within the European shipping systems.”

“Yes. There is always a need for improvement of ISO-containers.”

“I doubt that. Standards are important but it is more important with a standard on the handling of containers. I believe it would be more useful to improve the ISO container further.”

“Yes, there is a need for a new standard worldwide.”

Result: The answer is yes and no. We need better containers but they must be accepted everywhere in the transport chain. Some claim that the 45-foot container is sufficient. The negative respondent wants the work to take place at ISO.

9. Are there other ways of reaching the goals of optimising the cargo container and limit detrimental environmental effects?

Shippers		Operators					Terminals		Equipment
									

“Yes. Efficient road, rail and ships. Quicker ports and more geared for short sea. Total concepts for better speed and flow.”

“Highlight the IPSI terminal system and work close to industry development.”

“Develop the 45-foot-container and implement it further on into the intermodal transport systems. Work with the tonnage to be 45-feet-fitted. Upgrade the ports to handle increased weights.”

Result: Our respondents point out many other ways to optimise the transport. Speed and capacity in loading/discharging operations are factors that many mentioned. The IPSI¹⁴², another proposal to promote short sea shipping, was mentioned. Does the EILU fit into the IPSI-system?

¹⁴² Improved Port/Ship Interface

Appendix II) The case studies

As a result from our pilot study we decided to conduct a multiple case study to find out different consequences of shipping a container similar to the proposed EILU. From the pilot study we learned that the 45 feet pallet-wide high cube container is very close to the long EILU and we therefore put up a case study protocol for such cases.

The case study protocol

Descriptive theory

As the transport volumes increase, the Commission must propose a sustainable solution to transport problems, particularly road congestion. One action is the proposal of the European Intermodal Loading Unit (EILU), combining the size of swap-bodies and the strength of ISO-containers. The theory says that the large size enables less road vehicles. Smooth intermodality is a key factor if the theory should contribute to any reduction of road traffic.

For long distance traffic like in Sweden there will be a great potential in reducing the number of road vehicles by combining one long and one short EILU per vehicle. This means that sea legs to support this set-up must carry 50% each of long and short units. The EILU is also judged not to be allowed in international traffic which probably means that the EILU and the ISO must live together onboard the same short sea vessel.

Overview of the project

The objectives

This case study will investigate possible consequences of an EILU in port and onboard vessels.

Case study issues

As smooth intermodality is a key factor, the consequences to sea transports are vital. The intermodal shipper must be offered a smooth and non-complicated sea going alternative to road or rail. The carrier must be able to offer a competitive price, gaining a high utility of the vessels and get large scale effects. Important factors are the utility of each unit, moving of empty units, balance in flows, “grey box concepts”, and combination of intra-EU and international cargo flows.

Long EILU ~ 45ft PWHC

The proposed long EILU is very close to a 45-foot pallet-wide container. We will study the latter one in three cases from different points of view. In such may we will make the case study to a triangulated strategy. During each case we will ask ourselves about the differences versus the long EILU and also the proposed short EILU. We will also ask relevant questions to find out what differences may occur if the EILU proposal should be realised.

Key figures of cargo units

Type	45ft PWHC	Long EILU	Short EILU	40ft PWHC	20ft PWHC
External length (mm)	13,716	=<13,600	=<7,820	12,192	6,058
External width (mm)	2,460	=<2,550	=<2,550	2,460	2,460
External height (mm)	2,896	2,670	2,670	2,896	2,896
Internal length (mm)	13,630	13,200+	7,200+	12,100	5,925
Internal width (mm)	2,420	2,460	2,460	2,420	2,420
Internal height (mm)	2,690	2,479 (?)	2,479 (?)	2,690	2,690
Tare weight (kg)	4,620	~4,800	~2,900	3,200	2,880
Payload (kg)	30,380	~29,200	~27,700	29,800	27,600
Cellular width	Yes	No	No	Yes	Yes
Stackable	3/7/10	4	7	7/10	7/10
EUR-pallet capacity (0,8x1,2)	34	33	18	30	14

Sources

We ask the participants to contribute to the study with relevant material such as:

- Documents (administrative documents, articles, cargo plans, etc)
- Archival records (historic data, organizational records, survey data, etc)
- Interviews (focused interviews confirming data collected)
- Direct observations (visits to ports and vessels)

We will choose the case studies from general cargo flows to and from Sweden where short sea shipping may be an alternative to road or rail. Triangulation is formed via **multiple-case design** added by a “4-party-approach” via **Shippers** (transport buyers), **Operators** (Carriers, Owners, Lines), **Terminals** (Ports) and **Suppliers** (Equipment suppliers, container leasing companies).

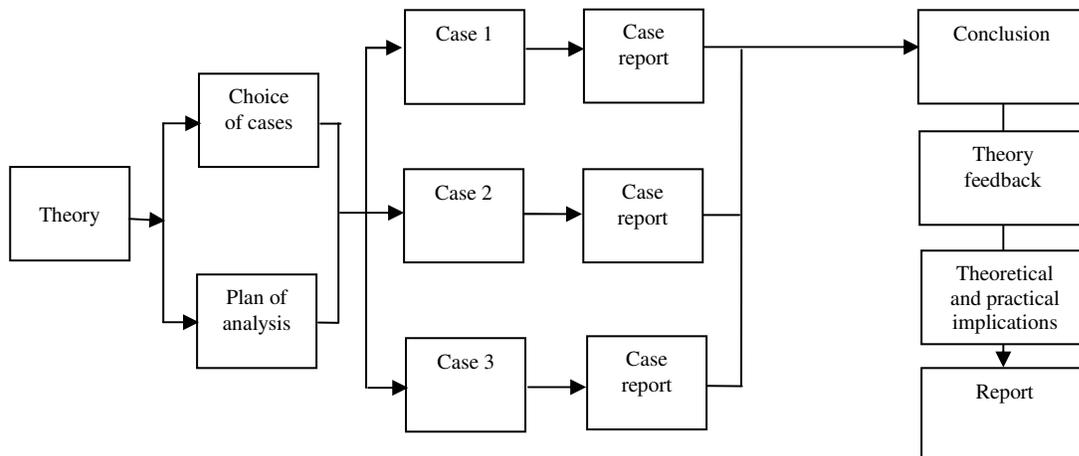
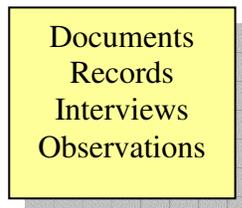


Figure 1) Multiple case study design

Field procedures

The case study is initiated from one of the parties involved in the case. The Shipper, Operator, Terminals and Equipment supplier are identified and from them authorisation will be requested to perform this case study.

The case is thereafter analysed from physical aspects and an action plan is made. The case study will then be conducted via contacts with respondents. Each respondent is asked to contribute with material formed by documents, records, interviews and observations.



Every respondent has the right to protect non-official materials and figures.

The research team will visit as many sites in the transport chain as possible, within the project budget and time. Complementary information needed is gathered through phone and mail contacts.

When visiting the site, the procedures will include:

- 1) Identification of personnel involved in the case
- 2) Presentation of the case study and its purpose
- 3) Inventory of available information
- 4) Authorisation to take photographs

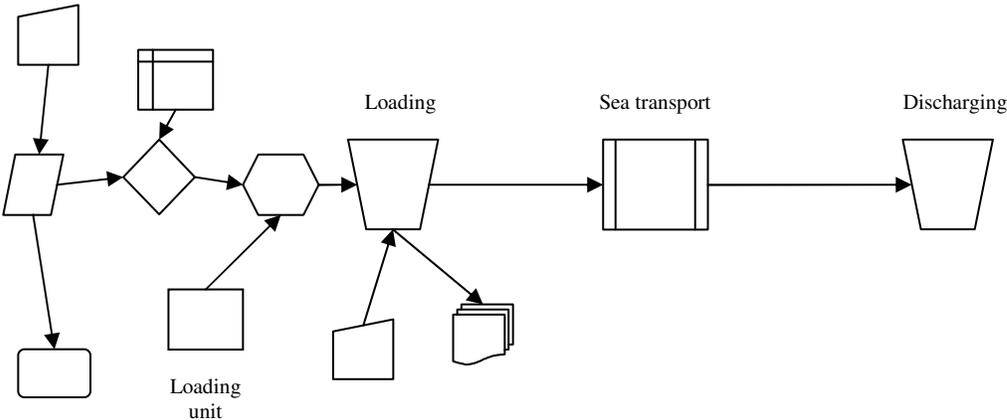
Guide for the report

The analysis is made through reduction of material into a matrix for each case. Details and special information may be added via footnotes and separate texts.

	Shippers	Operators	Terminals	Equipment
Preferences				
Price				
Alternatives				
Stowage				
Handling				
EILU difference				

The three cases are thereafter compared to each other (pattern matching). If any discrepancies are found they are judged from the difference in case conditions and other circumstances affecting the results. A summary matrix of the same design is then drawn and put against the theory (the EILU proposal) together with the pilot study and secondary data collected before.

The matrix design is also to be complemented by a flow chart description of each case showing consequences of using a 45 feet PWHC container in these cases:



The case

According to the general description of our case study given above, you are kindly asked to participate in one of three cases. The following data describes “this case”:

Case number (1-3): _____

Type of intermodal loading unit: 45feet PWHC

Loading place of the unit: _____

Destination: _____

Cargo: _____

Palletised: Yes / No

Loading port: _____

Discharging port: _____

Type of vessel: _____

Name of Shipper: _____

Name of Carrier: _____

Name of port agent A: _____

 B: _____

Name of equipment supplier: _____

Alternative carrier(s): _____

Checklist: Requirements fulfilled

- Import/export cargo
- Sea transport is an alternative to other modes (road or rail)
- The 45ft PWHC container is used
- Acceptance from actors above to participate in this case study
(any party may refuse to disclose confidential information)

Questions

Questions during data collection

Shipper (Transport buyer)

Preferences for this loading unit

Cargo description and criteria

Cargo intake in different units (weight and volume)

Pallets

Alternatives and evaluation process in choice of:

- Loading unit

- ISO-containers
- Pallet-wide containers
- Swap-bodies
- Semi-trailers
- Other:

- Carrier (intermodal combination)

- Road (only)
- Road – Rail - Road
- Road – Sea – Road
- Road – Sea – Inland water - Road
- Other:



- Transport statistics
- Price and quality
- Added value for you?
- Demand / Supply curves?
- Transfer time and frequency
- Alternatives
- Would the EILU proposal change anything?

Documents
Records
Interviews
Observations

Operator (Carrier)

The function of the 45ft PWHC within the service/line

Attraction of customers

Internal benefits

Stowage onboard

- Restrictions
- Possible positions
- Problems to port rotation / shifting
- Fillage / utilisation of vessel
- Half length problem
- Special equipment needed

In this case

If 50% is 45ft PWHC combined with 50% ISO containers

If 100% is 45ft PWHC

If changing to Long EILU

If 30% Long EILU and 30% Short EILU and 40% ISO containers

Terminal handling

- Equipment
- Storage areas
- Loading and discharging

Affecting the transport and handling cost?

Do customers pay extra for this? Added value for the customers? Demand / Supply curves?

Key features to intermodal loading units necessary for the operation in this case. (position of corner fittings, etc)

Would the EILU proposal change anything above?

Any recommendations to an EILU proposal?

Terminal (Port authority / stevedores / port agent)

Documents
Records
Interviews
Observations

Port dues for: This case: _____

Cargo handling cost: This case: _____

and time: This case: _____

Practical aspects for this case: Terminal area
Handling equipment
Stowage and securing onboard

Discussion: Oversize units / PWHC - ISO standard - EILU proposal

Other aspects to the EILU proposal? Proposals, objections?

Equipment supplier

Documents
Records
Interviews
Observations

Describe the order criteria given in this case (the customer need and preferences):

Did you try to give any other dimensions as an alternative to the request?

If an EILU-standard were in force, would the situation be different?

Standard prices	To buy	To lease	Ref: ICF report (EURO)
C20			1,400
C40			2,200
C45			2,450
C20 PWHC			2,700
C40 PWHC			4,300
C45 PWHC			4,900

Judge the difference to the proposed: Long EILU: _____(ICF: EUR 4,800)

Short EILU: _____(ICF: EUR 3,200)

Case report 1

Type of intermodal loading unit:	45feet PWHC ¹⁴³
Loading place of the unit:	Örebro, Sweden
Destination:	Wrexham, UK
Cargo:	Paper reels (forest products)
Palletised:	No
Loading port:	Västerås, Sweden
Discharging port:	Goole, UK
Type of vessel:	M/V Odin, LoLo container feeder (no cell guides)
Name of Shipper:	“Cartonboard manufacturer, Örebro, Sweden”
Name of Carrier:	Paltrans
Name of port agent	A: Paltrans
	B: Paltrans
Name of equipment supplier:	Paltrans
Alternative carrier(s):	Semi-trailer operators via Göteborg or the Continent.



Figure C1-1) Case no 1 in Pal Line UK Service, source: www.paltrans.se

¹⁴³ Pallet-wide High Cube (PWHC). Paltrans describe the same thing as WideBody High Cube (WBHC).

General

Paltrans, Sweden, offers modern logistic services to international and European dry cargo flows. In the Pal Line UK Service Paltrans uses modern pallet-wide high cubes with a length of 20- 40 or 45 feet. The service is operated by modern 45-foot-container friendly LoLo-vessels. We studied one 45ft PWHC on its assignment from Sweden to UK. We found this case to be very representative with many connections to our work and the criteria for a case to be fulfilled.



Figure C1-2) Örebro – Västerås – (Oxelösund) – Goole – Wrexham
Source: Hallbjörner/Tyrén 2004.

Description

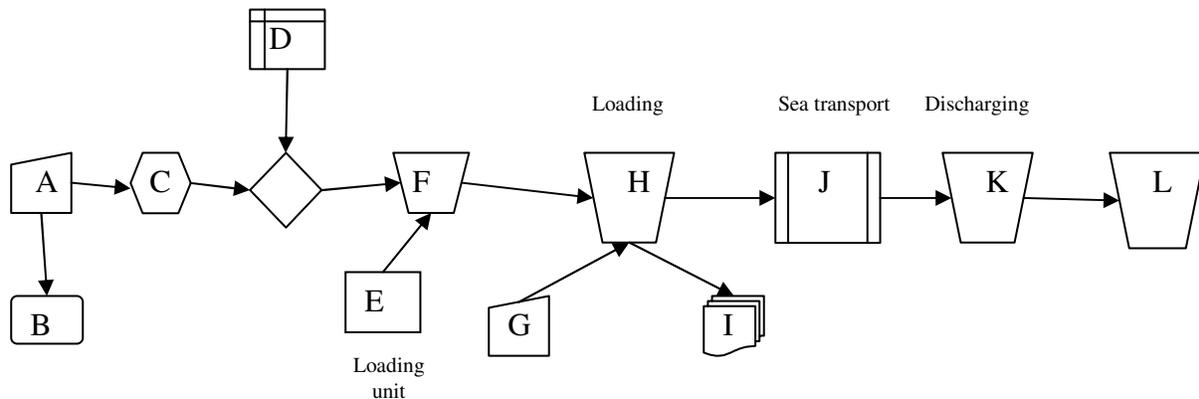


Figure C1-3) Flow chart, source: Hallbjörner/Tyrén 2004.

A) An export contract is made between the seller (the Cartonboard manufacturer outside Örebro, Sweden) and the buyer (located in Wrexham, UK) on CIF basis. The CIF-term makes the seller to be the transport buyer and carries out a purchase process asking for transport quotations.

B) Alternative carriers, e.g. transport by semi-trailer operators, are available. Paltrans offers the 45-feet PWHC container in order to meet the size of the semi-trailer.

C) A contract on full liner terms (road transports included) is made with Paltrans, Sweden. The contract stipulates a certain number of tons per year, with an intention that Paltrans will ship 50% in 40ft containers and 50% in 45ft containers. The transport price is different depending on type of unit, making a 45ft unit less cost per ton cargo but increased charged freight per container, which generates a kind of win-win situation. The transport chain and administration are prepared. Instructions and arrangements for stuffing of the containers are made by Pal Line staff, as well as instructions for discharging the container at the destination.

D) The seller puts the products (paper reels) in stock for shipment. They call for shipment according the contract made in C.

E) Paltrans container allocation system nominates the most suitable container.

F) Paltrans allocates the loading unit nominated for this transport assignment and arranges a road vehicle for the loading at the Cartonboard manufacturer and further transfer to the port of Västerås.

G) Paltrans booking system generates a loading list for the departure of MV Odin. A stowage plan is made. The onboard stowage is planned. This stowage plan has to consider following information:

- Number of 20, 40 and 45-ft units
- Number of electric connected units (heat and/or reefer)
- Number and classification of dangerous goods
- Type and amount of general cargo to be carried
- Port of loading, destination and weight of each unit
- Cargo to and from other ports already stowed onboard
- Cargo to and from other ports on the voyage to Goole

The 45ft units have to be assigned special positions on deck only. (Ref. to the stowage plan of MV Odin.) The positions under deck are technically usable as the containers are fitted with 12 bottom fittings, but generates too many restrictions in planning (the full cargo hatch must be discharged to reach the 45ft unit stowed under deck) and also lost space, as the position fore or aft will only be able to use for a 20ft container.

H) The container is loaded onboard the MV Odin. The stowage and securing is made by twistlocks, and if stowed in second or higher layer secured by rods and turnbuckles as well. The hatch is fitted with fittings in the corner position with (45ft distance), to enable full stackability of the 45ft units. The dimensions of the cargo hatches make the “extra 5 feet” possible to extend fore and aft of the holds. This 45ft friendly design generates minimum of lost space, as long as we have a mix of units. Depending on the mix of cargo this affects the voyage calculation differently.

MV Odin has no cell guides but can only accommodate 45ft containers on deck anyway. This makes a mix of sizes (20-, 40 and 45ft units) necessary to fill up a vessel. Paltrans therefore sees the 45ft as a complement, which also is reflected in the contract with the carton board manufacturer.

I) The shipment is documented and data are transferred to the different documents and information systems for bill of lading, customs, invoicing, etc.

J) The shipment is carried out.

K) The vessel arrives at Goole and the loading units (containers) are discharged. The express units are put direct to the vehicles and so are our 45ft unit. The unit is transported by a Paltrans contracted vehicle instructed in according the arrangement lined out in “C”.

L) The container is stripped and the cargo is delivered. The container stays on the vehicle during the stripping. After discharging the vehicle and the 45ft PWHC moves to the next assignment, loading UK products for Sweden.

Paltrans seeks for balance in using the same types of units. During our investigation Paltrans finds good balance in cargo flows using the 45ft units, with a slight dominance in volumes from UK to Sweden.

The use of the 45ft container is in this case preferred from both sides. The shipper is offered a slightly better price per ton cargo and Paltrans is able to charge a slightly better price per

container, giving a better result on the road leg but a small disadvantage onboard, depending on the mix of units. In some mixed condition even the onboard stowage is better with 45ft units included. The cargo intake in the 45ft PWHC unit is 20 tons, compared to the 40ft PWHC which is 17 tons.

Paltrans confirms the approximate estimated prices for different intermodal loading units presented in the ICF report dated in October 2003¹⁴⁴.

Difference to the EILU-proposal

Following comments on the EILU-proposal was made.

The long EILU is very similar to the 45ft PWHC in general, but the details count. It is an important facility to have 12 bottom fitting. Or else there will be stowage problem using 40ft fittings. Please note that a 45ft unit may be stowed on top of one 40ft or two 20ft containers, leaving an overhang of 5 ft.

The long EILU with external length of 13.6m would likely have the problem to be stowed in positions for 45ft units, leaving the question how to solve the corner fittings? Are there only to be 40ft distance and if so, in what positions? If impossible to arrange 45ft distance the existing 45ft fittings onboard cannot be used. How to reach full stackability then?

Paltrans recommends using the 45ft PWHC standard as the long EILU.

The short EILU is quite impossible. It is not possible to combine with any of the other units, not even with the long EILU. The short units should be disqualified. The 20ft and 40ft PWHC is much more global and more easy to combine with the 45ft PWHC.

¹⁴⁴ ICF Consulting Ltd (2003), Economic Analysis of Proposed Standardisation And Harmonisation Requirements, Final Report, 2003-10-13 , London UK

Pal Line UK Service

Schedule MV Odin

	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu
Södertälje																
Västerås																
Oxelösund																
Oskarshamn																
Goole																

Vessel particulars MV Odin



Owners style	As T/C owner Paltrans Shipping AB
Flag	Antigua
Homeport	Hamburg
Built	1994/10
Classification	Germanischer Lloyd
Call sign	V 2 A F 6
IMO no:	9101144
DWAT/ GT/ NT/ GRT	4530/2997/1320/1418
Loa/ Boa/ Draft	96,4/15,9/5,94
Moulded depth	7,54 m
Dwcc summer/ winter	4100/4000
Capacity grain/ bale	155000/145000 cbft
Capacity cbm	Abt 5500 cbm lp
Hatch dimensions	25,2 x 12,82 m each
Hold dimensions	25,2 x 12,82 m each
Hold height	6,05 m
Number of holds/ bulkheads	2 holds/ 0 bulkheads
Ceiling	Steelfloored
Tanktop strength	13,0 ts/sqm
Hatchcover strength	1,65 ts/sqm
Speed/ consumption	15 knots/abt 10,6 tnfo 180/rme25 / day ISO-condition
Cranes	Gearless
Other particulars	304 teu fully container fitted, 74H / 230D 25 reefer points
Ice class	1 B
Standard equipment	Bowthruster
Class	gl + 100 a5 "stregthened for heavy cargo" "g"

Source: www.paltrans.se

Stowage plan for MV Odin

Total capacity in TEU: 304 TEU (74H / 230D)

Total capacity in DWCC: 4100 ton

Max permissible stack weight: 60 resp 80 tons (see figure 4d)

Other restrictions: The transverse 20ft positions between the hatches block the cargo hatches and are therefore rarely used.

Positions for 40ft PWHC: 144 positions

Positions for 45ft PWHC: 80 positions

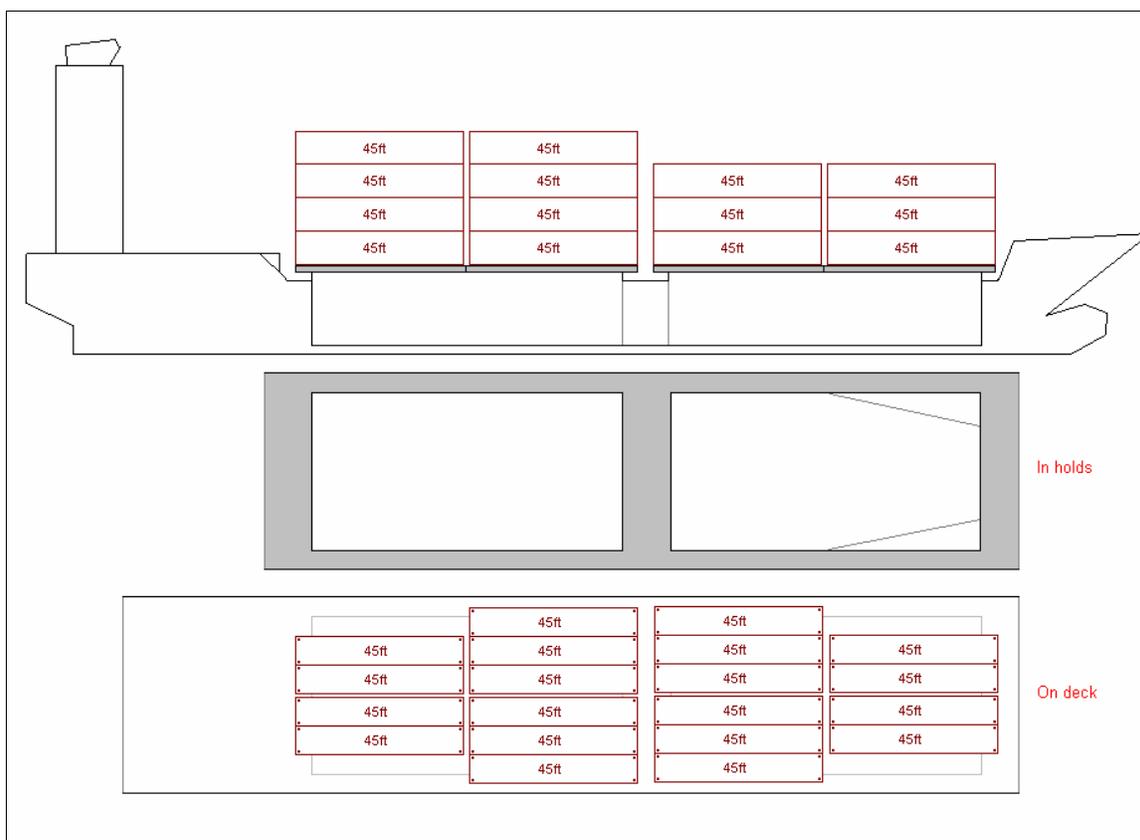


Figure C1-4a) 45ft positions. Note corner fitting positions used.

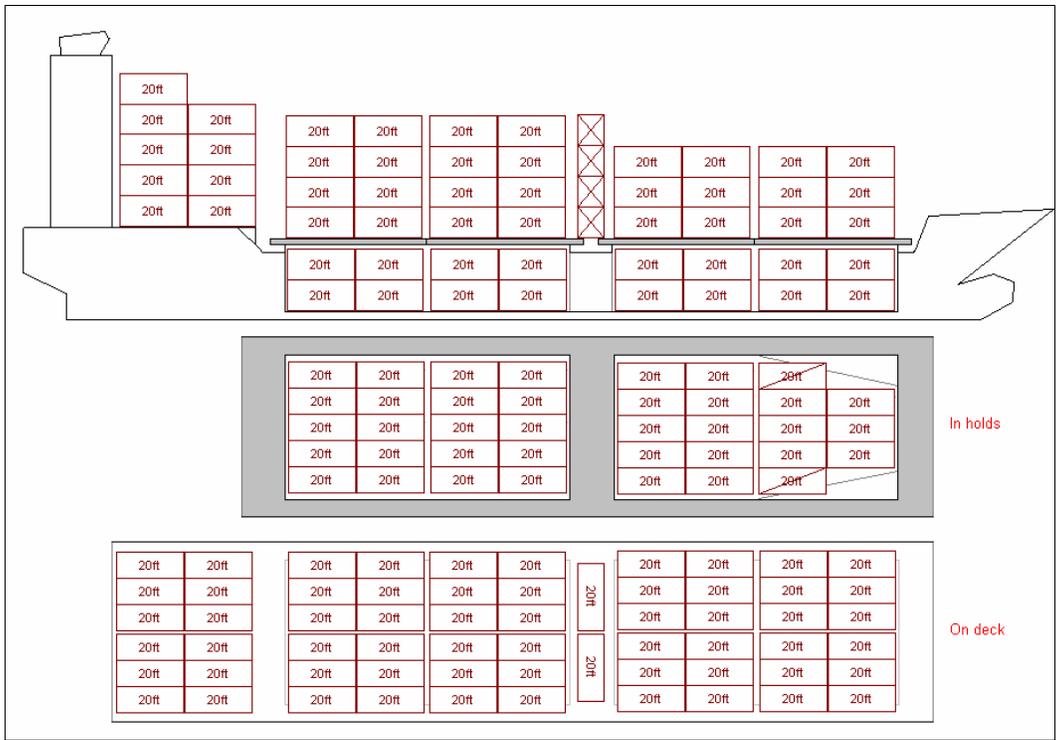


Figure C1-4b) 20ft positions (TEU)

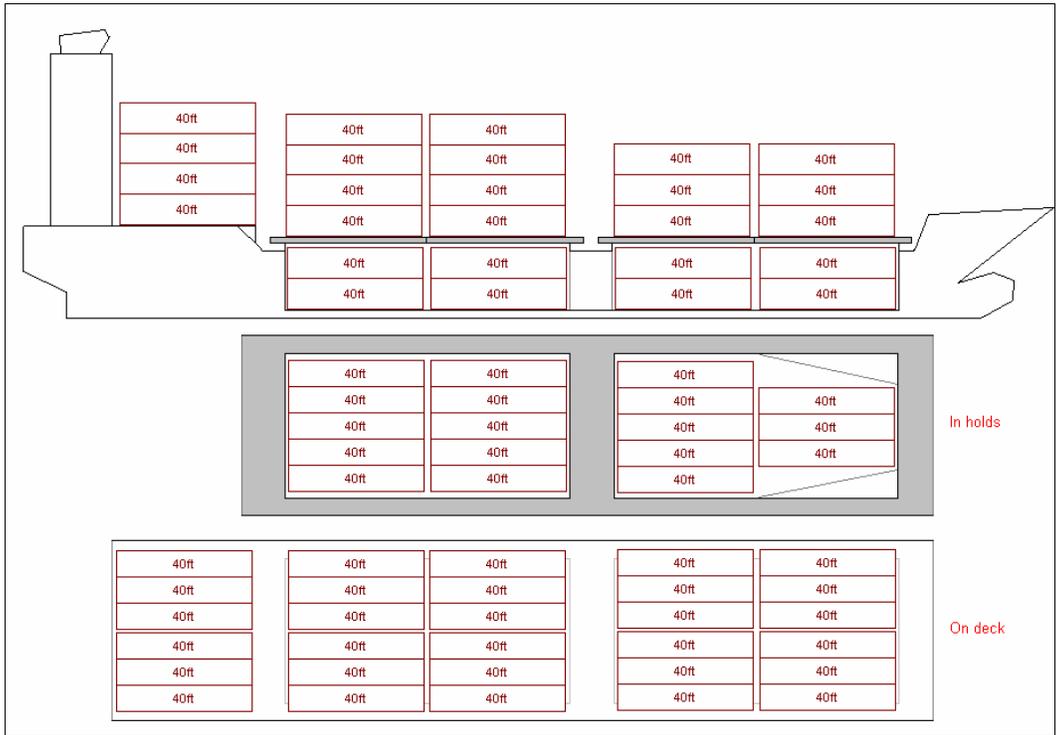


Figure C1-4c) 40ft positions (FEU)

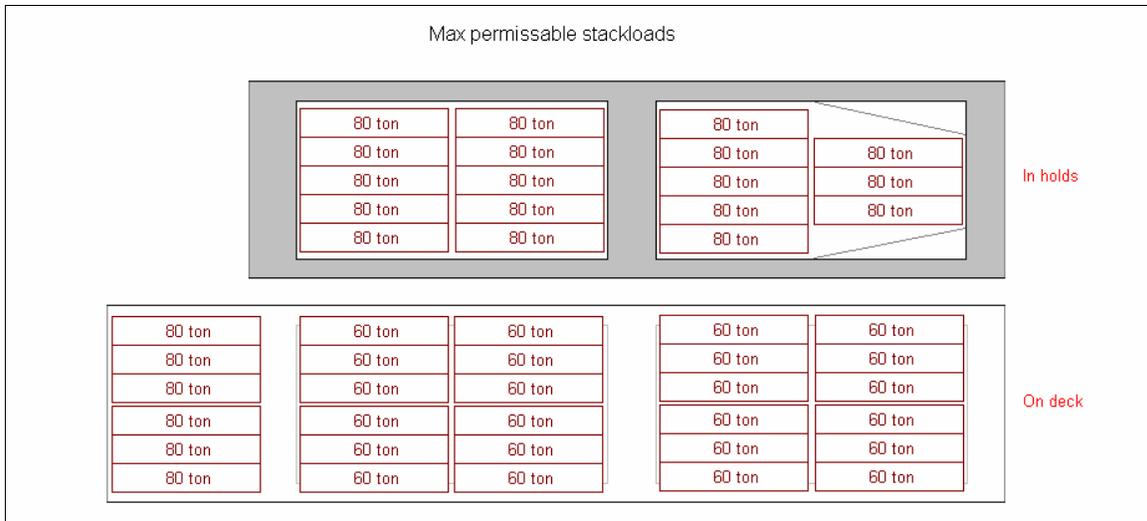


Figure C1-4d) Max permissible stack weight

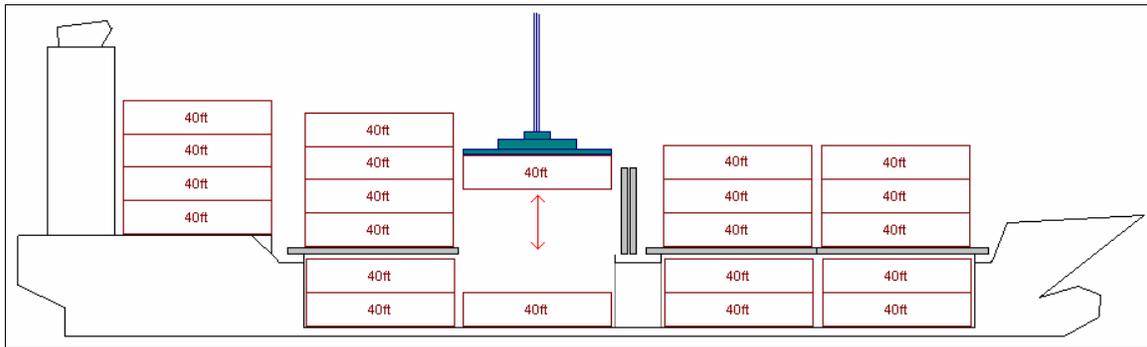


Figure C1-4e) Principle of access. Important in planning for port rotation and stowage avoiding shifting of cargo in ports.

Source: Paltrans, edited by Hallbjörner, 2004

Calculation of pallet capacity M/V Odin

Following table gives the theoretical pallet capacity in cases with different number of container sizes, all pallet-wide:

	Number of container positions, full stack height								PWHC			Non pallet-wide			
									Units	Pall/unit	Pall cap	Pall/unit	Pall cap		
20ft															
Deck	30	24	24	24	24	24	18	18	18	18	230	14	3 220	11	2530
Hold			10	10	10	10	10	10	8	6	74	14	1 036	11	814
Total											304		4 256	3344	
Compared to non pallet-wide containers:											27%				
40ft															
Deck	24		24	24			18	18			108	30	3 240	25	2700
Hold			10	10			10	6			36	30	1 080	25	900
Total											144		4 320	3600	
Compared to non pallet-wide containers:											20%				
45ft															
Deck			16	24			18	12			70	34	2 380		
Hold											0		0		
Total											70		2 380		
Optimal mix 40ft/45ft															
Deck 40ft	24		8					6			38	30	1 140		
Deck 45ft			16	24			18	12			70	34	2 380		
Hold 40ft			10	10			10	6			36	30	1 080		
Hold 45ft											0	34	0		
Total											144		4 600		
Increase compared to 40ft PWHC alternative:											6%				

One pallet = Europallet 1.2m * 0.8m

Figure C1-5a) Maximum cargo intake with no consideration to stability, stack weight or deadweight restrictions. Calculation of pallet capacity due to different type of units.

		Number of container positions, stack height on deck: 3 layers				PWHC								
						Units	Pall/unit	Pall cap	ton/unit	ton				
20ft														
Deck	18	18	18	18	6	18	18	18	18	186	14	2 604	8	1488
Hold		10	10	10	10	10	10	8	6	74	14	1 036	8	592
Total						260		3 640						2080
40ft														
Deck	18	18	18			18	18			90	30	2 700	17	1530
Hold		10	10			10	6			36	30	1 080	17	612
Total						126		3 780						2142
45ft														
Deck		12	18			18	12			60	34	2 040	20	1200
Hold										0		0	20	0
Total						60		2 040						1200
Optimal mix 40ft/45ft														
Deck 40ft	18	6					6			30	30	900	17	510
Deck 45ft		12	18			18	12			60	34	2 040	20	1200
Hold 40ft		10	10			10	6			36	30	1 080	17	612
Hold 45ft										0	34	0	20	0
Total						126		4 020						2322
<i>Increased to 40ft alternative</i>											6%	8%		

One pallet = Europallet 1.2m * 0.8m

Figure C1-5b) Normal cargo intake, calculation of pallet capacity and net cargo weight capacity (tare excluded) due to different type of units.

Container specification Paltrans 45ft PWHC

Dimensions		
External	Length	13,716 m
	Width	2,500 m
	Height	2,896 m
Internal	Length	13,556 m
	Width	2,420 m
	Height	2,691 m
	Volume	89,10 m³
Nominal door	Width	2,354 m
	Height	2,581 m
Ratings	Max gross weight	34,00 ton
	Tara weight	4,45 ton
	Payload	29,55 ton
Floor strength	Max point load	7,2 ton/ axle loading

Source: www.paltrans.se



Figure C1-6) 45ft PWHC stowed on deck, source: www.paltrans.se

Facilities: Opening in short side.
12 twistlock fittings in bottom, 8 fittings in roof (see figure 7)
Stackability (see figure 7)
Does not fit in cell guides (external width 2,50m), to be secured via twistlocks.
Manufactured in China

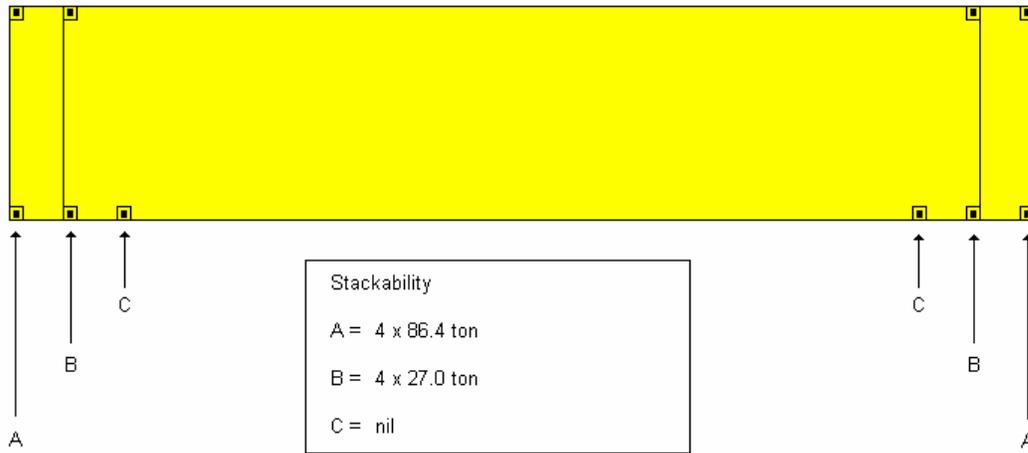


Figure C1-7) Stackability using different twistlock positions. Hallbjörner/Tyrén, 2004.

Port descriptions

Goole, UK

Location: Goole is located on the River Ouse, 43nm from the North Sea.

General overview: The port handles a wide range of cargoes including large tonnages of timber, fuel products, steel, coal, grain, vehicles and containers. The port has an inland location and is directly linked to the UK rail system, motorway system and inland waterways network.

Traffic figures: The port handles over 2,800,000t of cargo annually.

Load Line zone: North Atlantic Winter Seasonal Zone II, Winter Nov 1 to Mar 31, Summer Apr 1 to Oct 31.

Max size: Length 100m, beam 24m, draft 6.0m, approx 4,500dwt.

Västerås, Sweden

Location: Västerås is situated at the NW end of Lake Mälaren.

General overview: The port, which is a well equipped modern harbour, serves the regions metal industries, saw mills and paper mills. It is kept open all year round by powerful ice breaking tugs but ice obstruction is possible between January and March.

The principal exports are grain, iron, steel and other metals, timber, paper and general goods.

Imports include mineral and fuel oils, scrap iron, pig iron, coal, coke, minerals, cement, fodder and general goods.

Traffic figures: Approx imports 1,600,000t, exports 500,000t, including 25,000teu handled annually.

Load Line zone: Summer Zone for ships over 100m in length and Winter Zone for ships of 100m or less. Winter Nov 1 to Mar 31, Summer Apr 1 to Oct 31.

Max size: Södertälje ship channel: Max LOA 124m, beam 18m and max draft 7.0m.

Largest vessel handled: "Holmön", 10400dwt, draft 6.8m.

Distances

	Södertälje	Västerås	Oxelösund	Goole
Södertälje	-	44 M	60 M	1001 M *)
Västerås	44 M	-	123 M	1060 M *)
Oxelösund	60 M	123 M	-	970 M *)
Goole	1001 M *)	1060 M *)	970 M *)	-

*) Route via Öresund and Skaw. A route via the Kiel Canal is 120 M less.

Source: Fairplay WSE

Summary

The analysis is made through reduction of material into a matrix:

	Shippers	Operators	Terminals	Equipment
Preferences	Size of shipment Price sensitive Customer service	Size = semi-trailer Competition Balance in container flow	-	-
Price	Price per ton decrease	Price per unit slightly higher	Must follow same unit price as 40ft	Slightly higher
Alternatives	Semi-trailer operators 40ft PWHC	40ft PWHC	-	40ft PWHC
Stuffing and Stowage	Non palletised cargo, 20 tons intake (light density volume cargo)	Onboard: On deck in certain positions. Separate stowage Need 45ft distance fittings	-	-
Handling gear	-	Same gear as 40ft Separate handling	Same gear as 40ft Separate handling	-
EILU difference	-	Depending on the EILU's position of corner fittings and strength. (45 ft corner fittings?) The short EILU is a problem International tonnage is used (cargo hold design)	Stackability Short EILU problem	International manufacturing and 2 nd hand market might be difficult with an EILU

Case report 2

Type of intermodal loading unit: 45feet PWHC¹⁴⁵

Loading place of the unit: Småland, Sweden
Destination: Midlands, UK
Cargo: General cargo

Palletised: Yes

Loading port: Åhus, Sweden
Discharging port: Immingham, UK

Type of vessel: M/V Adele J, LoLo container feeder
(no cell guides)

Name of Shipper: Confidential
Name of Carrier: Samskip
Name of port agent A: Samskip
B: Samskip
Name of equipment supplier: Own and hired

Alternative carrier(s): Semitrailer operators via Göteborg or
the Continent.on RoRo ferries



¹⁴⁵ Pallet-wide High Cube (PWHC).

General

The shipping company Samskip was founded in 1990 on Iceland. Samskip specialises in providing door-to-door transport for FCL (full loads) and LCL shipments using both the company's vessels and containers fleet as well as its partner's services in Scandinavia and the Baltic.

With the support of its offices in Iceland, Norway, Sweden, Denmark, UK, Belgium, Netherlands, Germany, Russia, China, South Korea, Canada and United States Samskip offers sailings to over 30 ports in the North Sea and the Baltic Sea as well as to the main ports of the world.

Collection and deliveries are arranged from/to all locations in the World via an extensive network of agents and reliable partners.

The container we chose to study is a route from Åhus to Immingham with palletised general cargo. This shipment fits well into our case description as an intra-EU shipment.



Figure C2-1) Åhus - Immingham
Source: Hallbjörner/Tyrén 2004.

Description

All bookings are made by the cargo owner directly to Samskip via telephone or fax. The cargo is entered into the cargo list for the specific vessel, in our case, Adele J.

The cargo list is sent to the Adele J and the cargo planning is made by the chief officer onboard. Samskip does not interfere with the cargo planning. Several factors influence the chief officer's decisions when making the cargo plan:

- Number of 20, 40 and 45-ft units
- Number of electric connected units (heat and/or reefer)
- Number and classification of dangerous goods
- Type and amount of general cargo to be carried
- Port of loading, destination and weight of each unit
- Cargo to and from other ports already stowed onboard
- Cargo to and from other ports on the voyage to Immingham

The cargo planning is aided by special cargo calculation computers in order to make it easy to calculate the stability of the ship at different cargo conditions.

The 45ft units can only be placed on deck. The under deck positions are technically usable as the 45ft containers are fitted with 12 bottom fittings, but generates too many restrictions in planning and also lost space, as the positions fore or aft will be blocked for 40 ft containers.

The container is loaded onboard the Adele J. The stowage and securing is made by twistlocks, and if stowed in second layer, secured by rods and turnbuckles as well. The hatch is fitted with fittings 40 ft wide apart, but the bays are 45 ft each. This 45ft friendly design generates minimum of lost space. 45 ft units can be loaded virtually anywhere on the hatch.

The documents for the shipment are forwarded to appropriate authorities, forwarders, recipients etc.

The vessel arrives at Immingham and the loading units (containers) are discharged. The express units are put direct on vehicles and the others are stored, awaiting collection or loading onto another vessel.

The container is stripped and the cargo is delivered. After discharging, the vehicle and the 45ft PWHC is booked for the next assignment.

In this particular case, the use of the 45ft container is partly the result of economic decisions. The cargo owner wants to evaluate different cargo units and the financial outcome of them. The balance availability – demand and the resulting impact on the market price are important for the decision making process when choosing which cargo unit to use. The main question here is “are those extra five feet of container worth the extra dollars?” The cargo owner comments that the “Pallet-wide 45’ units have a potential, but for the moment they are not what they promised to be.” The market still largely sticks to standard 20’ and 40’ units, despite the oncoming need for

larger units. The container is more suitable for this cargo owner than the semi-trailer. The container obviously provides a more robust protection of the cargo and a container is easier to handle. Once it is loaded and closed, the cargo is well protected.

The cargo owner also uses 45' PW containers for railway transports, with good results.

Inside the container, the palletised goods is normally stowed in a single layer. Some cargo has been stowed in two layers with good results. This stowage is of course depending on the type of cargo stowed to avoid cargo damage.

The cargo owner comments “we would be happy to see the pallet-wide container internal width grow to 2.45 – 2.50 m. This would largely ease cargo handling and reduce cargo damage.” The cargo owner uses many types of non-standard pallets as well as the Europallet and the possibility to mix different pallet types increases with even slightly wider containers.

Vessel particulars MV Adele J



Figure C2-2) MV Adele J. Source: www.arkon-shipping.de

CLASS: GL + 100 A4 E+ MC AUT strengthened for heavy cargo, equipped for carriage of containers 202 TEU	12 tns / sqm distributed load
TYPE: Singledecker, box	DIMENSIONS: Length o. a.: 87,60 m Beam: 13,10 m
CONTAINER CAPACITY: 202 TEUS whereof 104 in hold and 98 on deck altern.: 96x40' plus 8x20', able to load same amount 2,50m wide container intake basis 9'6"= 170 TEUS 30 reefer	ENGINES: 1320 kw 1 bowthruster 130kw Aux. Engine = 2 of 149kw and 1 of 130kw
DEADWEIGHT CAPACITY: abt 3200 DWAT on abt 5,07 m draft	VENTILATION: 6 fold basis empty holds
SPEED AND CONSUMPTION: abt 12,5 knots on abt 6,8 tns Gasoil/draft 4,40m abt 12 knots on abt 6,3 tns Gasoil/draft 5,07m	CARGO HOLD / HATCH: 1 hatch of 57,50 x 10,20 m 1 hold of 57,40 x 10,20 x 8,20 m
CUBIC CAPACITY IN HOLDS: abt 160.000 cbft	GEAR: No
DECK STRENGTH: 60 / 90 tns - 20' / 40' stack 25 / 40 tns - 20' / 40' stack	REGISTER TONNAGE: GT / NT 2463 / 1227
	TANK CAPACITIES: 2596 tns Ballast 120 tns Gasoil 21 tns Freshwater

Source: www.arkon-shipping.de

Stowage plan for MV Adele J

Total capacity in TEU:	202 TEU (104H / 98D)
Total capacity in DWCC:	3000 ton
Max permissible stackweight:	60/90 resp 25/40 tons
Positions for 40ft PWHC:	78
Positions for 45ft PWHC:	36
Other information:	Stowage of 45ft containers is made by using the 40ft container fittings.

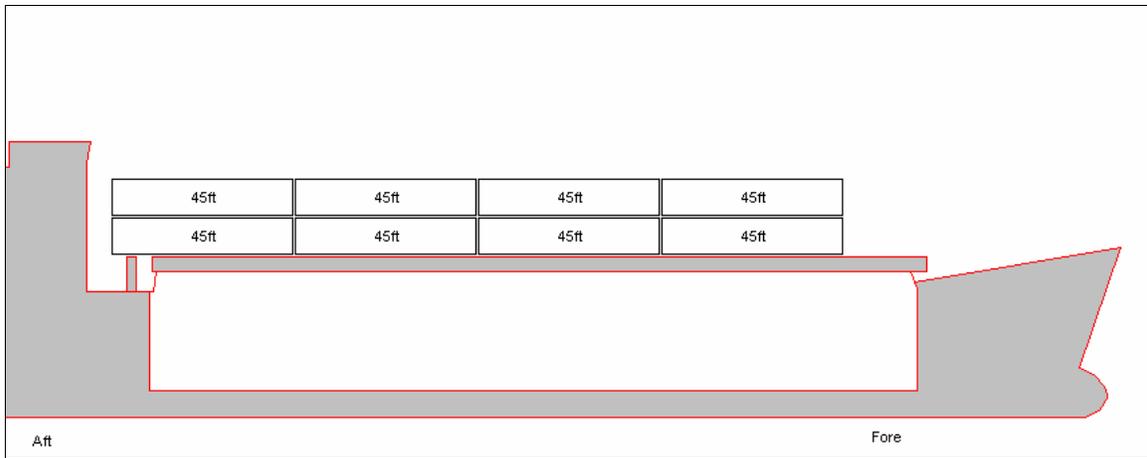


Figure C2-3a) 45ft positions. Source: Hallbjörner 2004 based on info from Samskip.

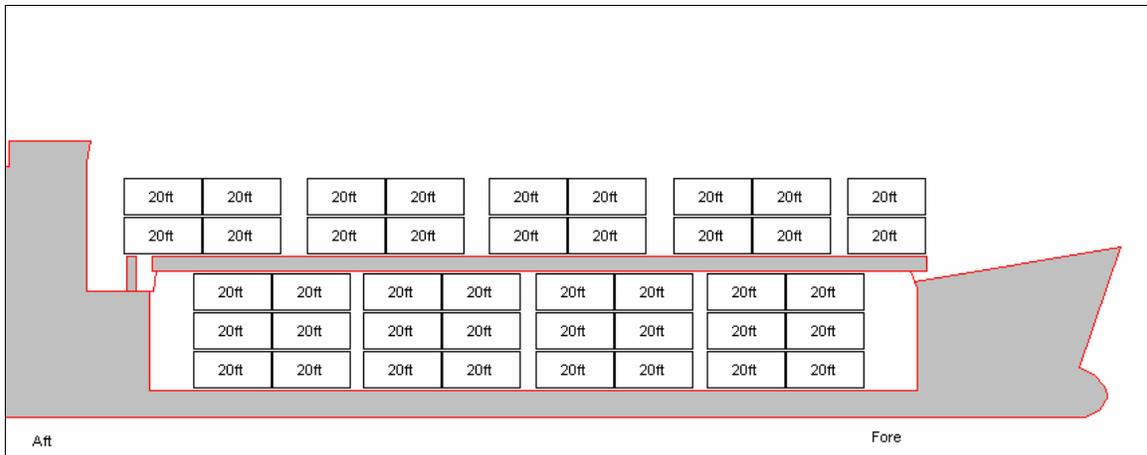


Figure C2-3b) 20ft positions. Source: Hallbjörner 2004 based on info from Samskip.

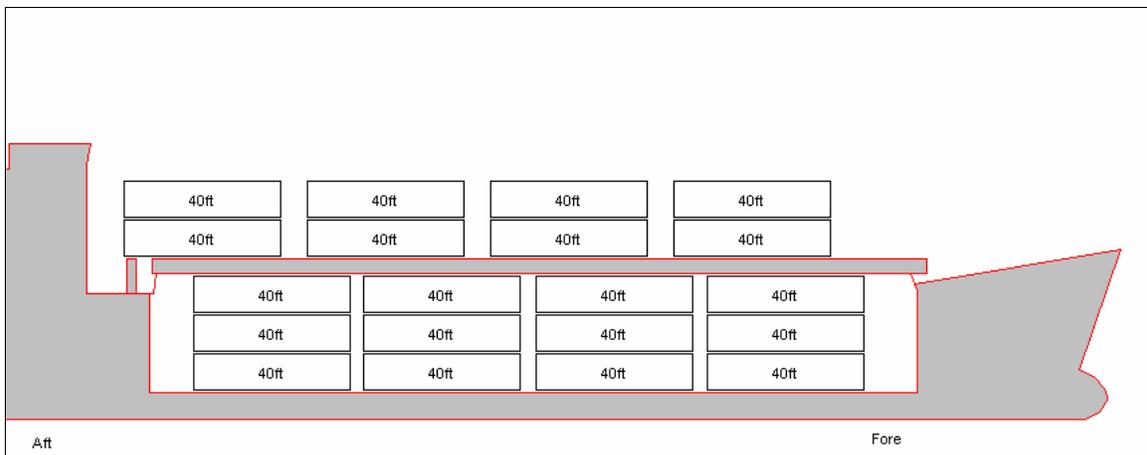


Figure C2-3c) 40ft positions. Source: Hallbjörner 2004 based on info from Samskip.

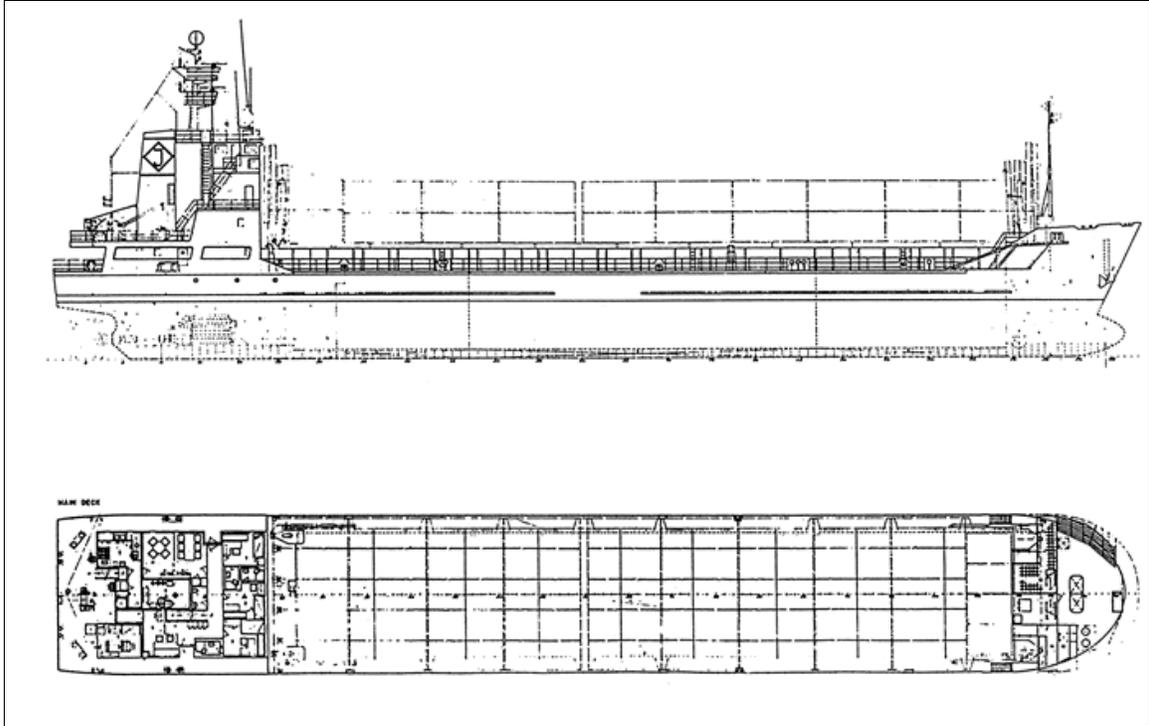


Figure C2-4) General arrangement M/V Adele J, Source: www.arkon-shipping.de

Calculation of pallet capacity M/V Adele J

		Number of container positions, full stack height						PWHC			Non pallet-wide			
								Units	Pall/unit	Pall cap	Pall/unit	Pall cap		
20ft														
Deck	6	10	10	10	10	6	10	10	8	80	14	1 120	11	880
Hold	12	12	12	12	12	12	12	8		92	14	1 288	11	1012
Total										172		2 408		1892
Compared to non pallet-wide containers:										27%				
40ft														
Deck	6		10	10			10			36	30	1 080	25	900
Hold	12		12	12			6			42	30	1 260	25	1050
Total										78		2 340		1950
Compared to non pallet-wide containers:										20%				
45ft														
Deck	6		10	10			10			36	34	1 224		
Hold										0		0		
Total										36		1 224		
Optimal mix 40ft/45ft														
Deck 40ft										0	30	0		
Deck 45ft	6		10	10			10			36	34	1 224		
Hold 40ft	12		12	12			6			42	30	1 260		
Hold 45ft										0	34	0		
Total										78		2 484		
Increase compared to 40ft PWHC alternative:										6%				
One pallet = Europallet 1.2m * 0.8m														

Figure C2-6) Maximum cargo intake with no consideration to stackability, stack weight or deadweight restrictions. Calculation of pallet capacity due to different type of units. Source: Hallbjörner, 2004.

Port descriptions

Immingham, UK

Location: Immingham is located on the River Humber, a few miles from the North Sea.

General overview: The port handles a wide range of cargoes including large tonnages of timber, fuel products, steel, coal, grain, vehicles and containers. The port has an inland location and is directly linked to the UK rail system, motorway system and inland waterways network.

Traffic figures: The port handles over 2,800,000t of cargo annually.

Load Line zone: North Atlantic Winter Seasonal Zone II, Winter Nov 1 to Mar 31, Summer Apr 1 to Oct 31.

Max size: Length 100m, beam 24m, draft 6.0m, approx 4,500dwt.

Åhus, Sweden

Location: Åhus is located on the South Eastern coast of Sweden, SE of Kristianstad.

General overview: The port, is a well equipped and fully modern. One million tons of goods per year can be loaded or discharged in the port of Åhus. The port is one of South Sweden's most important harbours for bulk and cargo.

Capacity: 3000 TEUs can be stored in the port. Vessels up to 160 m LOA / 8.2 m draft can be handled in the port. Crane capacity: 45 tons. Total length of quays: 1 595 m.

Load Line zone: Summer Zone for ships over 100m in length and Winter Zone for ships of 100m or less. Winter Nov 1 to Mar 31, Summer Apr 1 to Oct 31.

The entrance channel to the port is 1.2 NM long and 70 m wide. Depth 8.5 m

Distances

Åhus – Immingham: 552 M via the Skaw.

Source: BP digital distance tables

Summary

The analysis is made through reduction of material into a matrix:

	Shipper	Operator	Terminal	Supplier
Preferences	Size of shipment Price sensitive Customer service	Competition Balance in container flow	-	-
Price	Price per ton decrease	Price per unit slightly higher	Must follow same unit price as 40ft	Slightly higher
Alternatives	Semitrailer operators 40ft PWHC	40ft PWHC	-	40ft PWHC
Stuffing and Stowage	Non palletised cargo, (volume cargo)	Onboard: On deck in same positions as 40ft. Arrangement rebuild for this purpose.	-	-
Handling gear	-	Same gear as 40ft	Same gear as 40ft	-
EILU difference	-	The short EILU is a problem International tonnage is used (cargo hold design)	Short EILU problem	International manufacturing and 2 nd hand market might be difficult with an EILU

Case report 3

Type of intermodal loading unit: 45feet PWHC¹⁴⁶

Loading place of the unit: Göteborg, Sweden
Destination: Charleston, US
Cargo: Steel industry spare parts

Palletised: Yes

Loading port: Göteborg, Sweden
Discharging port: Hamburg, Germany

Type of vessel: LoLo container feeder
with cell guides in the holds.

Name of Shipper: Confidential
Name of Carrier: Confidential
Name of port agent A: Confidential
B: Confidential
Name of equipment supplier: Confidential

Alternative carrier(s): Semitrailer via trailer ferry from Göteborg or other port
to the continent.

¹⁴⁶ Pallet-wide High Cube (PWHC).

General

This case is based on a container feeder service running between a number of ports in Scandinavia and northern Europe. The flow that we are following is the sealeg Göteborg – Hamburg. Frequent, scheduled departures are characteristic for this route. The main part of units shipped are ordinary ISO 20’ and 40’ containers, but also occasional 45’ units are found, both 8’6 and HC:s¹⁴⁷. Most of the cargo is shifted to larger, ocean going vessels. This is also the case with the specific unit in this case. The final POD¹⁴⁸ is Charleston, US.



Figure C3-1) Göteborg - Hamburg
Source: Hallbjörner/Tyrén 2004.

¹⁴⁷ High Cubes (HC), with external height of 9’6” (2.9m).

¹⁴⁸ Port of destination (POD)

Description

The freight booking is normally made electronically. Since many of the freight owners are regular customers, much of the information needed is already stored in the company's computer systems. Information about destination, weight, unit size, unit type, dangerous cargo specifications, etc is fed into the system.

A cargo booking list is sent to the head office where the cargo planning is made, the completed cargo plan is then sent back to the loading port, in this case Göteborg. Any alterations to the cargo plan will then be made locally at the company's branch office in Göteborg. As in previous cases, certain important factors have to be taken into account:

- Number of 20, 40 and 45-ft units
- Number of electric connected units (heat and/or reefer)
- Number and classification of dangerous goods
- Type and amount of general cargo to be carried
- Port of loading, destination and weight of each unit
- Cargo to and from other ports already stowed onboard

The container is loaded onboard the vessel. The stowage and securing is made by twistlocks on the hatch. The cargo hold under the hatch is fitted with cell guides, with no 45' bays. The 45ft units can only be stowed at certain positions on deck.

The shipment is documented and freight documents, customs declarations, bills of lading etc are sent to different receivers for administrative purposes.

The vessel arrives at Hamburg and the units onboard are discharged. The express units are put directly on trucks; the others are stored in port until they are picked up by a local freight company or loaded on to another ship. The container carrier in our case does not deal with this part of the shipment. The containers are taken over by an overseas carrier and so the responsibility.

When the container reaches its final port of discharge (Charleston, US) it will be subject to customs inspections, but since Göteborg is an accredited "safe port" approved by the US authorities the checks will be less thorough than for goods coming from a non- accredited port. The container will then quickly be forwarded to the customer by truck.

Vessel particulars



Figure C3-2) The vessel similar to our case.
Source: Tyrén 2004.

Year built:	2002
Ice Class:	1A
LOA:	132,23
BM:	19,40
Max Draught:	7,35
NT:	3240
GT:	6386
DWAT:	8493
Service speed:	17,5
Hatches:	3
TEU Capacity:	698

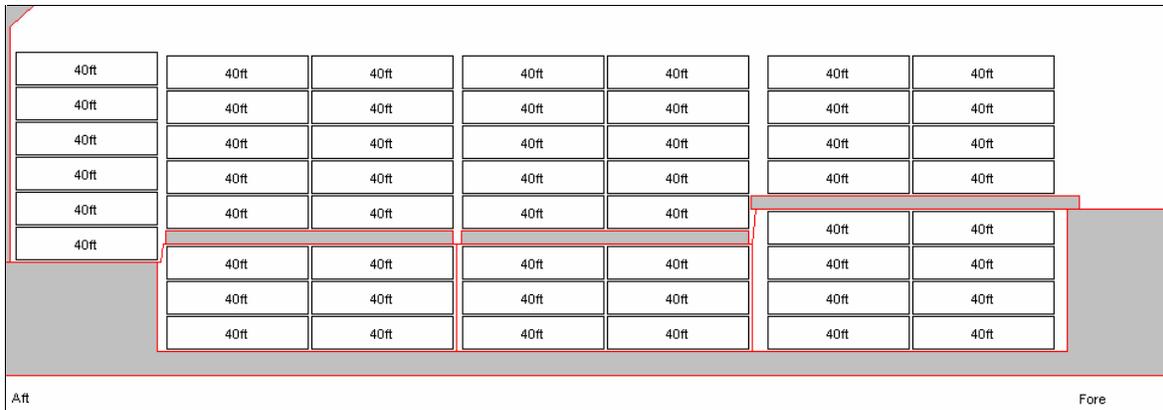


Figure C3-3c) 40ft positions, Source: Hallbjörner (2004)

Calculation of pallet capacity

Following table gives the theoretical pallet capacity in cases with different number of container sizes, all pallet-wide:

	Number of container positions, full stack height											PWHC			Non pallet-wide					
														Pall / unit	Pall cap					
20ft																				
Deck	40	40	35	35	35	35	35	35	35	35	28	28	24	24	12	476	14	6 664	11	5236
Hold			16	18	18	18	18	18	18	18	15	13	9	5		184	14	2 576	11	2024
Total																660	9 240		7260	
Compared to non pallet-wide containers:																27%				
40ft																				
Deck	40		35	35	35	35			28	24						232	30	6 960	25	5800
Hold			16	18	18	18			13	5						88	30	2 640	25	2200
Total																320	9 600		8000	
Compared to non pallet-wide containers:																20%				
45ft																				
Deck									28	24						52	34	1 768		
Hold																0		0		
Total																52	1 768			
Optimal mix																				
40ft/45ft																				
Deck 40ft	40		35	35	35	35										180	30	5 400		
Deck 45ft									28	24						52	34	1 768		
Hold 40ft			16	18	18	18			13	5						88	30	2 640		
Hold 45ft																0	34	0		
Total																320	9 808			
Increase compared to 40ft PWHC alternative:																2%				
One pallet = Europallet 1.2m * 0.8m																				

Figure C3-4) Maximum cargo intake with no consideration to stackability, stack weight or deadweight restrictions. Calculation of pallet capacity due to different type of units. Source: Hallbjörner, 2004.

Port descriptions

Hamburg, Germany

Location: Hamburg is located on the River Elbe, about 60 M up the river.

General overview: The port handles a wide range of cargoes including large tonnages of timber, fuel products, steel, coal, grain, vehicles and containers. The port has an inland location and is directly linked to the rail system, motorway system and inland waterways network.

Traffic figures: The port handles over 106,000,000t of cargo annually and is one of the largest in the area.

Load Line zone: North Atlantic Winter Seasonal Zone II, Winter Nov 1 to Mar 31, Summer Apr 1 to Oct 31.

Göteborg, Sweden

Location: Göteborg is situated on the Swedish west coast, half-way between Strömstad and Malmö.

General overview:

The port is Sweden's largest, with a potential to grow even more, regarding the figure of handled TEUs. The "Skandiahammen" area is being expanded to accommodate more cargo and to handle more ships.

The principal exports include containers, refined oil, gas and other petroleum products, forest products as well as general cargo. RoRo units and car exports also form a big part of the goods handled in the port.

Imports include crude oil, fruit, general cargo, containers and cars/trailers.

Traffic figures: Approx 750 000 TEU of containers and 265 000 trade cars pass the port every year.

Load Line zone: Summer Zone for ships over 100m in length and Winter Zone for ships of 100m or less. Winter Nov 1 to Mar 31, Summer Apr 1 to Oct 31.

Max size: Largest vessel: 351 m max. load and 18.9 m max depth

Distances

Göteborg – Hamburg: 326 M via the Kiel Canal, a route around the Skaw is 76 M longer

Source: BP digital distance tables

The problem with a Intra-EU unit on international trades

The stowage problems for this voyage, Göteborg – Hamburg, are the same as in case 1 and 2. What is more interesting is the final destination of the cargo, the United States. Sending the cargo stowed in an EILU container would cause several different problems during the voyage. Stowage and handling would be the two main problems. Virtually all deep sea container carriers are fitted with cell guides. The problems with stowing EILU containers onboard these container carriers must not be overlooked; the cell guides are in most cases fixed to the ships structure and cannot be moved. In most cases, where the cell guides have to be modified, the cost would be substantial and would inevitably lead to higher freight rates in the end. The remaining space to stow the EILU containers are then on the hatch, secured with twistlocks and rods. The number of spaces on each ship suitable to accommodate an EILU will be limited.

The next problem arises when the container is unloaded in Charleston. The US infra-structure is of course not compatible with the European cargo unit. ISO containers, on the other hand, have been around for a long time. The only foreseeable problem is that certain US states prohibits a 45' container on a truck because of the length of the vehicle.

The process of incorporating the EILU into the US, as well as Asian, Australian etc, markets is not to be discussed here but one can imagine the difficulties along the way.

What we have found is the following: a great deal of cargo from Scandinavia is shipped to countries outside the EU. Sometimes different destinations are shipped in the same unit, and in these cases the unloading and loading of the cargo into the unit will take place anyway. Most of the time, however, the container is to remain closed until the final destination, this is the general idea of the container concept. What we would get from this is two container flows; one Intra EU and one Ex EU. In many cases this would lead to higher costs for all involved: new container types to take into account, heavy investments in cargo handling equipment, modifications of vessels and monitoring of two types of container stocks. In those cases where only EILUs are available for an international shipper, the cargo inside will have to be shifted at a suitable port, at high costs.

We have also seen in this report that the dimensions of the EILU are not compatible with standard ISO containers. This will also lead to limitations on loading and stowage of the containers onboard and in port.

Port comments on the 45 feet pw container versus the EILU

In general discussions with port authorities, we have found that the “non standard” size of an EILU is likely to present internal problems at the ports. These mainly concern the storage of the EILU units in wait for loading on to a ship or truck.

The port stores containers in large blocks of 20 and 40’ units. Two 20’ containers are the same as one 40’, so the rows in the block are normally straight and easy to maintain. When a 45’ container is stored, they are placed in a 40’ stack, using the 40’ lashings. Units like the EILU will not fit into this system because of their difference in size and because of this they may have to be stored in a different part of the port or in a separate section within the block. In ports with limited storage space, this may present a problem.

Lifting the container may also prove to be a problem due to the dimensions of the unit and the placement of the cornerboxes where the container is lifted. On a 45’ container the cornerboxes are placed in the corners, and on certain cranes with adjustable spreaders, these boxes are used. In these cases the retractable corner guides of the spreader can be used to easily position the spreader on top of the container. Non-adjustable spreaders use the 40’ cornerboxes of the 45’ container. Since the corner guides cannot be used in this case, it takes somewhat longer to position the spreader and lift the container, thus prolonging the cargo handling time.

Summary

The analysis is made through reduction of material into a matrix:

	Shipper	Operator	Terminal	Supplier
Preferences	Size of shipment Price sensitive Customer service	Competition Balance in container flow	-	-
Price	Price per ton decrease	Price per unit slightly higher	Must follow same unit price as 40ft	Slightly higher
Alternatives	Semitrailer operators 40ft PWHC	40ft PWHC	-	40ft PWHC
Stuffing and Stowage	Palletised cargo.	Onboard: On deck in special positions with 45ft distance fittings.	-	-
Handling gear	-	Same gear as 40ft	Same gear as 40ft	-
EILU difference	-	The short EILU is a problem International tonnage is used (cargo hold design)	Short EILU problem	-

As mentioned in the discussion – the interesting parts in this case are the obvious problems that will arise when shipping outside of the EU. The loading unit will most likely not be compatible with the infrastructure in for instance the US or Asia. Getting acceptance for the new unit outside the EU may prove to be a very long and difficult process.

The alternative – to have two parallel container flows within EU is of course possible but would present several difficulties. The compatibility with ISO containers is one of the more important issues to take into account.

Appendix III) A voyage calculation study

The purpose with this part study is to compare the consequences in the choice of vessel type, i.e. RoRo- or LoLo-vessel, and the choice of intermodal loading unit.

	RoRo	LoLo
Price:	High	Low
Combinations:	Semi-trailers, swap-bodies, cars, passengers, etc	International container flows
Size restrictions:	RoRo-vessel must be of a certain size to be efficient	Can work in all sizes
Stackable units:	Not needed	Necessary
Cellular width:	Not important	Important to gain the operational benefits in cost, safety and speed
Extra equipment:	Rolltrailers or cassettes	None
Shipping cost affected by the EILU-proposal	No	Negative if the EILU becomes a dominant unit on the market

Following comparison between RoRo and LoLo was made:

		RoRo	LoLo	Diff
Voyage cost	<i>USD</i>	95 413	87 437	+9%
Cargo intake	<i>Pallets</i>	3 763	10 035	-63%
Cost per pallet	<i>USD/pallet</i>	25	9	+191%
Fuel consumption per pallet	<i>kg/pallet</i>	34	11	+201%

The RoRo-vessel offers the largest flexibility in respect of different types of loading units. This is also the main outcome of the IPSI-project. But our conclusion is that when it comes to intermodality and containers, the LoLo-vessel cannot be excluded. The LoLo-vessel is needed for services to ports with size restrictions and connections to global overseas services. The LoLo-concept is known to be a more cost efficient solution, something our calculations confirm.

But the LoLo-concept also depends on a good standard for containers, with defined external dimensions. Depending on the mix of cargo units, we have made following analysis of the impact of the choice and mix of unit type of the cargo intake - with the same effect on the shipping cost per unit and per pallet.

45ft containers mixed with 40ft containers

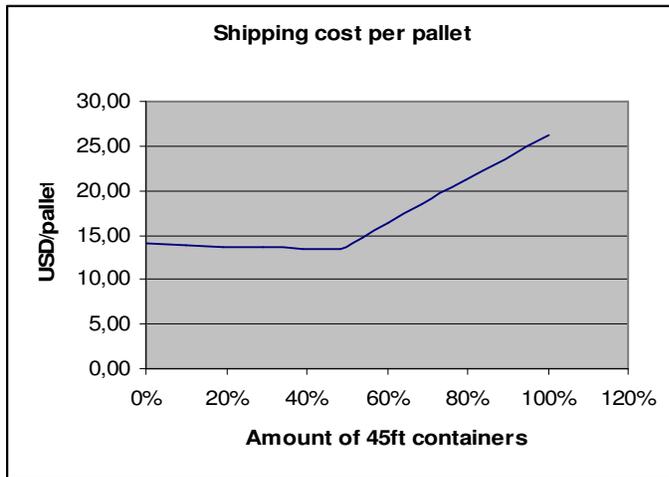


Figure D.2) The effect on using 45ft pallet-wide containers. Source: Hallbjörner, 2004.

Long EILUs mixed with 40ft containers

If the long EILU will be, as proposed, 13,600 mm long and with only 4 corner fittings in the bottom plate, leaving overhang both forward and aft, a difference will occur to the 45ft case above. The overhang of each EILU will intrude upon the closest position fore or aft of the EILU, and makes this space not able to use.

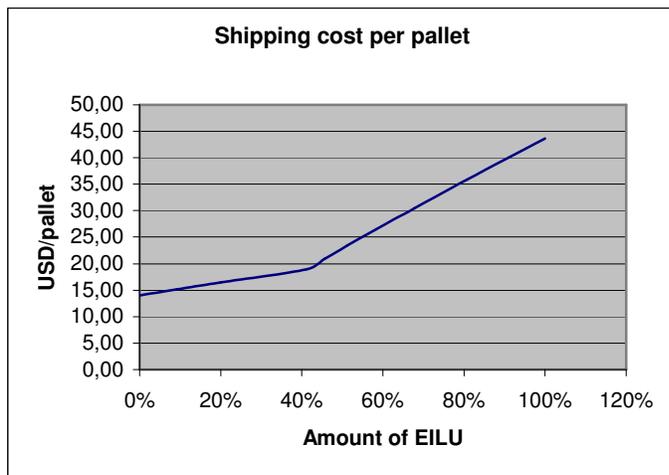


Figure D.3) The effect on using long EILUs. Source: Hallbjörner, 2004.

Type vessels

Population: Fairplay Encyclopedia.

Restriction: Vessels possible to enter Lake Mälaren, Sweden (small vessels):

	Min	Max
LOA	80	135
Beam	15	18
Built	1990	2005

Vessels:

LoLo:	140
RoRo:	33

Selection:

LoLo

TEU	Price(MUSD)	Built	DWT	Speed	Power	Cons
366	10,5	1995	4830	15,0	3000	11,32
326	12,9	1995	4600	15,5	4150	15,66
380	16,6	2001	5190	15,0	3900	14,72
375	6,6	1996	5300	16,0	3500	13,21
319	8,2	1990	6491	16,0	4400	16,61
303	9,6	1990	5100	14,0	3300	12,45
378	13,0	1992	5334	14,0	3690	13,93
384	10,0	1997	4600	15,5	5019	18,94
350	10,5	1997	5055	15,0	3690	13,93
350	10,5	1997	5055	15,0	3690	13,93
279	7,0	1993	4465	14,0	2309	8,71
260	11,0	1990	3000	14,6	2639	9,96
215	7,5	1997	4505	13,5	2400	9,06
381	10,0	2000	5183	15,0	3840	14,49
411	9,0	2000	6272	14,0	3360	12,68
323	10,2	1997	4649	14,5	3680	13,89
364	11,0	1996	5280	14,0	3280	12,38
448	11,7	1996	5905	14,5	3701	13,97
266	7,7	1996	3268	14,5	3280	12,38
366	11,3	1995	4850	15,0	2939	11,09
247	13,0	1993	4000	14,0	2199	8,30
338	10,4	1995	4902	14,7	3427	12,93
59	2,4	3	832	0,7	695	2,62

mean = type vessel

stddev

RoRo

Lanemeter	Price(MUSD)	Built	DWT	Speed	Power	Cons
1032	11,8	1990	4232	15,0	2960	11,17
1032	12,4	1990	4232	15,3	2960	11,17
1030	12,5	1991	4750	18,5	5960	22,49
896	14,2	1986	4673	15,0	5295	19,98
1015	13,0	1989	3094	17,0	5400	20,38

1001	12,8	1989	4196	16,2	4515	17,04	mean = type vessel
59	0,9	2	662	1,6	1442	5,44	stddev

Definition of small type vessels:

RoRo	
Type:	Small
Loa:	114,00 m
Beam:	17,20 m
Draft:	5,90 m
GT:	5599
NT:	1933
DWT:	4200 ton
Speed:	16 knots
Cons:	17 mt/d
Cargo cap:	1000 Lanemeter
DWCC:	3360 ton
VolCC:	82 FEU
<u>Intake</u>	
Weight per	
ILU:	19 ton/FEU
Number ILU:	82 FEU
Cargo	
weight:	1557 ton
Number of	
pallets:	2459
Price:	12,8 MUSD
Period:	20 years
Interest:	6%
Depr:	1 753 USD/d
Interest:	1 052 USD/d
Ship	
Management:	3 500 USD/d
T/C:	6 305 USD/d

LoLo	
Type:	Small
Loa:	93,70 m
Beam:	15,50 m
Draft:	6,25 m
GT:	3410
NT:	1810
DWT:	4900 ton
Speed:	14,7 knots
Cons:	13 mt/d
Cargo cap:	338 TEU
DWCC:	3920 ton
VolCC:	169 FEU
<u>Intake</u>	
Weight per	
ILU:	19 ton/FEU
Number ILU:	169 FEU
Cargo	
weight:	3211 ton
Number of	
pallets:	5070
Price:	10,3 MUSD
Period:	20 years
Interest:	6%
Depr:	1 411 USD/d
Interest:	847 USD/d
Ship	
Management:	3 500 USD/d
T/C:	5 758 USD/d

The full cargo condition is based on following cargo unit:

Conditions:	Full and complete cargo
Cargo:	EUR Pallets, 500 kg per pallet
ILUs:	40ft Pallet-wide units
Pallets per ILU:	30 pallets
Gross Weight per ILU:	19 ton

Large vessels for Short Sea Shipping not restricted:

	Min	Max
LOA	135	190
Beam	15	26
Built	1990	2005

Vessels

LoLo:	424
RoRo:	142

Selection:

LoLo

	TEU	Price(MUSD)	Built	DWT	Speed	Power	Cons
	1452	29,7	1994	20336	18,0	11128	42,00
	1452	28,4	1994	20088	19,0	11128	42,00
	1170	20,7	1995	13700	18,5	9738	36,75
	1129	17,0	1999	18400	18,5	10000	37,74
	834	13,7	1999	11400	18,0	7900	29,81
	1122	23,0	1996	14587	19,3	10920	41,21
	1160	20,0	1995	13700	18,5	9738	36,75
	1129	23,0	1997	18445	19,0	10018	37,81
	1216	20,0	2001	15315	23,0	15000	56,61
	1185	21,7	1997	16219	19,1	10619	40,08
	186	5,1	3	3182	1,5	1920	7,25

mean = type vessel
stddev

RoRo

	Lanemeter	Price(MUSD)	Built	DWT	Speed	Power	Cons
	1775	40,0	1998	8853	20,0	15600	58,87
	2600	48,0	1998	11600	22,0	24700	93,22
	2307	35,0	1997	9655	17,8	9848	37,17
	1511	39,0	1997	7630	20,0	14480	54,65
	2300	35,0	1996	9677	18,0	9850	37,17
	3200	31,5	1991	12968	16,0	9046	34,14
	1900	25,0	1996	11446	16,0	9000	33,97
	1511	40,0	1998	7629	20,0	14479	54,64
	1650	30,0	2002	5600	20,0	15600	58,87
	2270	47,0	1999	10680	19,0	14480	54,65
	1690	40,0	1999	8847	20,0	15592	58,84
	2065	37,3	1997	9508	19,0	13880	52,38
	526	6,9	3	2115	1,9	4546	17,16

mean = type vessel
stddev

Definition of large type vessels:

RoRo	
Type:	Large
Loa:	162,50 m
Beam:	25,60 m
Draft:	6,50 m
GT:	23986
NT:	7195
DWT:	9500 ton
Speed:	19 knots
Cons:	50 mt/d
Cargo cap:	2060 Lanemeter
DWCC:	7600 ton
VolCC:	169 FEU
<u>Intake</u>	
Weight per	
ILU:	19 ton/FEU
Number ILU:	169 FEU
Cargo	
weight:	3208 ton
Number of	
pallets:	5066
Price:	37,3 MUSD
Period:	20 years
Interest:	6%
Depr:	5 110 USD/d
Interest:	3 066 USD/d
Ship	
Management:	4 000 USD/d
T/C:	12 175 USD/d

LoLo	
Type:	Large
Loa:	154,00 m
Beam:	25,00 m
Draft:	9,50 m
GT:	13764
NT:	5157
DWT:	16200 ton
Speed:	19 knots
Cons:	40 mt/d
Cargo cap:	1180 TEU
DWCC:	12960 ton
VolCC:	590 FEU
<u>Intake</u>	
Weight per	
ILU:	19 ton/FEU
Number ILU:	590 FEU
Cargo	
weight:	11210 ton
Number of	
pallets:	17700
Price:	21,7 MUSD
Period:	20 years
Interest:	6%
Depr:	2 973 USD/d
Interest:	1 784 USD/d
Ship	
Management:	4 000 USD/d
T/C:	8 756 USD/d

Type voyages

Source of cargo flows are derived from the Institute of Shipping Analysis (SAI) and data from the Scandinavian Shipping Gazette (SST). Distances, port dues and bunker prices are brought from the Fairplay Encyclopedia and the Internet.

Voyage 1 and 2: Port of loading **with** restriction in size of vessel.

	<u>Long voyage</u>	<u>Short voyage</u>
Port of loading:	Västerås	Västerås
Port of discharging:	Rotterdam	Hamburg

Voyage 3 and 4: Port of loading **without** restriction in size of vessel.

	<u>Long voyage</u>	<u>Short voyage</u>
Port of loading:	Norrköping	Norrköping
Port of discharging:	Rotterdam	Hamburg

Voyage calculations

Small vessels:

		RoRo Small		LoLo Small	
Voyage:		1 (Long)	2 (Short)	1 (Long)	2 (Short)
Loading:		Västerås	Västerås	Västerås	Västerås
Discharging:		Rotterdam	Hamburg	Rotterdam	Hamburg
Distance:		2070	1184	2070	1184
Speed:		16	16	14,7	14,7
HFO price:		130	130	130	130
MDO price:		242	242	242	242
Cons Sea:		17	17	13	13
Cons Port:		2	2	1	1
T/C per day:		6305	6305	5800	5800
At Sea:	<i>d</i>	5,66	3,24	6,16	3,52
In Port:	<i>d</i>	2,00	2,00	2,00	2,00
Total time:	<i>d</i>	7,66	5,24	8,16	5,52
HFO cons:	<i>ton</i>	96,22	55,04	80,09	45,81
MDO cons:	<i>ton</i>	4,00	4,00	2,00	2,00
Port dues A:	<i>USD</i>	5 000	5 000	4 500	4 500
Port dues B:	<i>USD</i>	5 000	5 000	4 500	4 500
Canal fee:	<i>USD</i>	5 000	8 000	4 500	7 000
Bunkers:	<i>USD</i>	13 477	8 123	10 896	6 439
T/C:	<i>USD</i>	48 297	33 022	47 332	32 038
Voyage cost:	<i>USD</i>	76 774	59 145	71 728	54 477
<i>Cost/day</i>	<i>USD/d</i>	<i>10 023</i>	<i>11 293</i>	<i>8 789</i>	<i>9 862</i>
<u>Intake</u>					
ILU:		82	82	169	169
Pallets:		2 459	2 459	5 070	5 070
Cost per ILU:	<i>USD/FEU</i>	936	721	424	322
Cost per pallet:	<i>USD/pallet</i>	31	24	14	11
Fuel cons. per pallet:	<i>kg/pallet</i>	41	24	16	9

Bunkers: Official price Rotterdam on 5 Feb 2004

Large vessels:

		RoRo Large		LoLo Large	
Voyage:		3 (Long)	4 (Short)	3 (Long)	4 (Short)
Loading:		Norrköping	Norrköping	Norrköping	Norrköping
Discharging:		Rotterdam	Hamburg	Rotterdam	Hamburg
Distance:		1958	1096	1958	1096
Speed:		19	19	19	19
HFO price:		130	130	130	130
MDO price:		242	242	242	242
Cons Sea:		50	50	40	40
Cons Port:		3	3	2	2
T/C per day:		12175	12175	8756	8756
At Sea:	<i>d</i>	4,51	2,52	4,51	2,52
In Port:	<i>d</i>	3,00	3,00	5,00	5,00
Total time:	<i>d</i>	7,51	5,52	9,51	7,52
HFO cons:	<i>ton</i>	225,43	126,18	180,34	100,95
MDO cons:	<i>ton</i>	9,00	9,00	10,00	10,00
Port dues A:	<i>USD</i>	8 000	8 000	7 000	7 000
Port dues B:	<i>USD</i>	8 000	8 000	7 000	7 000
Canal fee:	<i>USD</i>	0	5 000	0	5 000
Bunkers:	<i>USD</i>	31 484	18 582	25 864	15 543
T/C:	<i>USD</i>	91 417	67 251	83 257	65 877
Voyage cost:	<i>USD</i>	138 900	106 833	123 121	100 421
<i>Cost/day</i>	<i>USD/d</i>	<i>18 499</i>	<i>19 341</i>	<i>12 948</i>	<i>13 347</i>
<u>Intake</u>					
ILU:		169	169	590	590
Pallets:		5 066	5 066	17 700	17 700
Cost per ILU:	<i>USD/FEU</i>	822	632	209	170
Cost per pallet:	<i>USD/pallet</i>	27	21	7	6
Fuel cons. per pallet:	<i>kg/pallet</i>	46	27	11	6

Bunkers: Official price Rotterdam on 5 Feb 2004

The mixture of cargo units is only judged to be affecting the LoLo-concept. Therefore we analyse the cargo intake of the small LoLo-vessel and calculate the shipping cost per pallet, in different cases.

45ft containers mixed with 40ft containers

Voyage cost	45ft %	45ft	40ft	pall/45ft	pall/40ft	total pallets	cost/pallet
60480	0%	0	144	33	30	4320	14,00
60480	10%	14	130	33	30	4362	13,87
60480	19%	28	116	33	30	4404	13,73
60480	29%	42	102	33	30	4446	13,60
60480	39%	56	88	33	30	4488	13,48
60480	49%	70	74	33	30	4530	13,35
60480	54%	70	60	33	30	4110	14,72
60480	60%	70	46	33	30	3690	16,39
60480	69%	70	32	33	30	3270	18,50
60480	80%	70	18	33	30	2850	21,22
60480	100%	70	0	33	30	2310	26,18

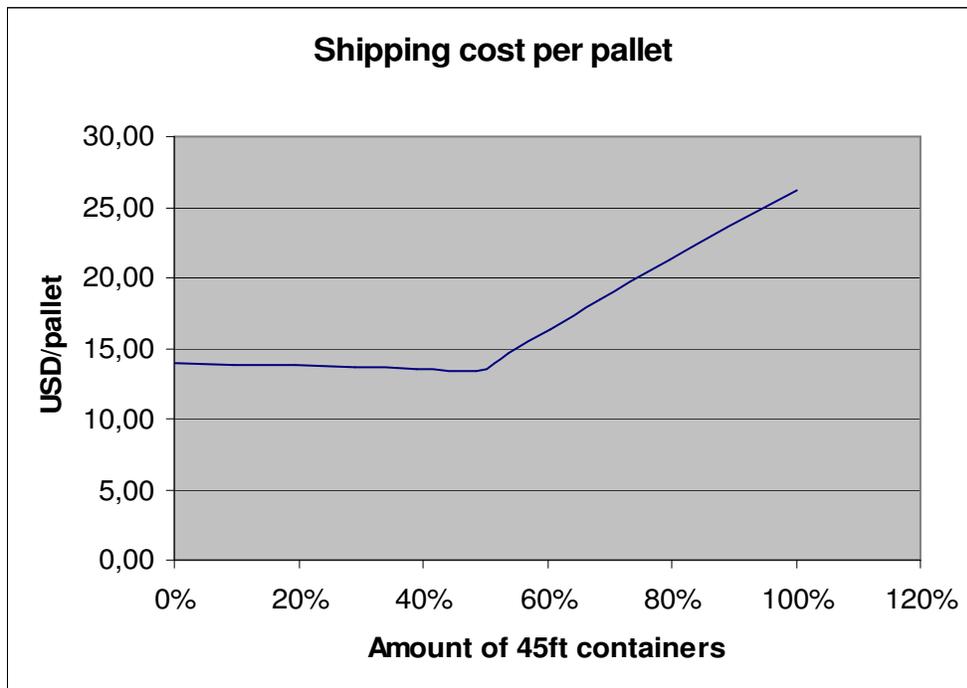


Figure D.2) The effect on using 45ft pallet-wide containers. Source: Hallbjörner, 2004.

Long EILUs mixed with 40ft containers

If, as proposed, the long EILU will be 13,600 mm long and with only 4 corner fittings in the bottom plate, leaving overhang both forward and aft, a difference will occur to the 45ft case above. The overhang of each EILU will intrude upon the closest position for or aft of the EILU, and block this space for use.

Voyage cost	EILU %	EILU	40ft	pall/EILU	pall/40ft	total pallets	cost/pallet
60480	0%	0	144	33	30	4320	14,00
60480	9%	12	120	33	30	3996	15,14
60480	20%	24	96	33	30	3672	16,47
60480	41%	42	60	33	30	3186	18,98
60480	46%	42	50	33	30	2886	20,96
60480	51%	42	40	33	30	2586	23,39
60480	58%	42	30	33	30	2286	26,46
60480	68%	42	20	33	30	1986	30,45
60480	81%	42	10	33	30	1686	35,87
60480	100%	42	0	33	30	1386	43,64

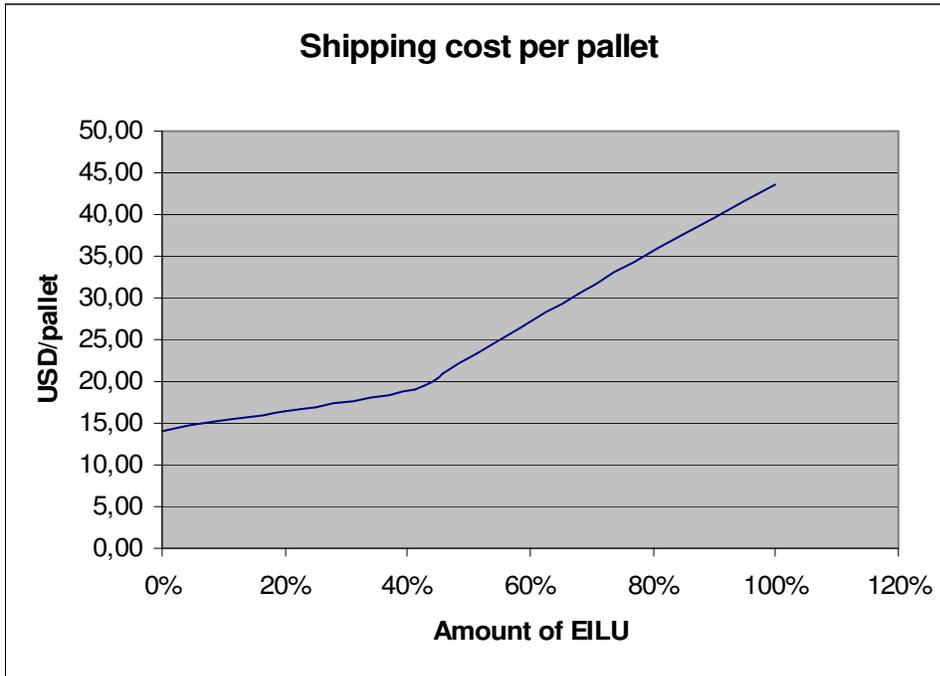


Figure D.3) The effect on using Long EILUs. Source: Hallbjörner, 2004.

Appendix IV) The pallet capacity of a LoLo-vessel

The purpose of this part study is to compare the cargo capacity using EILU contra CPCs¹⁴⁹ onboard a modern vessel. The study also ends up in some questions about design and cargo planning of ships.

Conclusion:

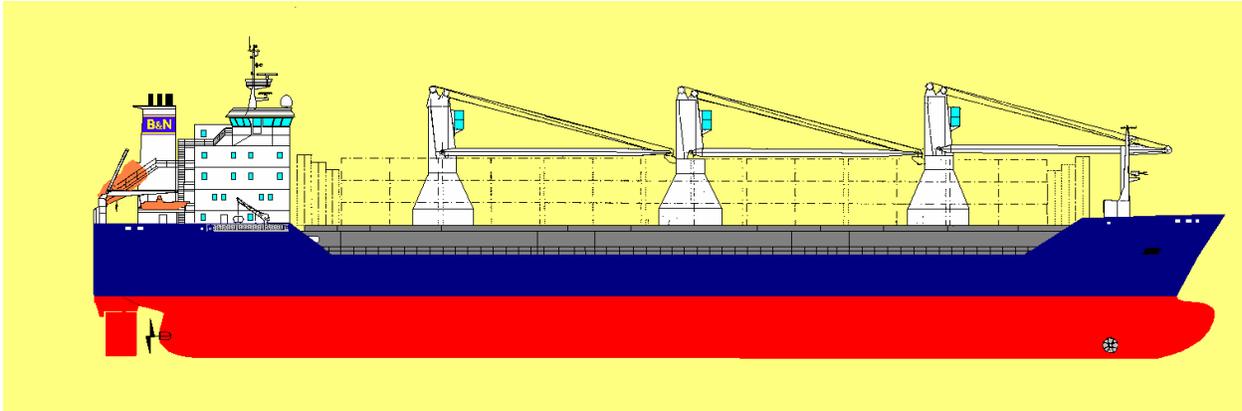
The effects of a cargo mix that only uses containers longer than 40ft are negative for shipping. There are already a number of 45ft units, but only as a complement to the 20ft and 40ft units. In some positions their “overhang” does not intrude upon other positions, and therefore they do not cause any lost space, but in the perspective of becoming a majority the ship design must be changed. If overlong units, i.e. 40ft+, will be in majority, we have to consider a new generation of vessels. Similar conclusion is made regarding the extended width.

Consequences:

- Stackability of 4 high is a restriction.
- The position of corner fittings and external dimensions of corner fittings are vital for access to twistlocks, mounting of rods and possibility of inspection. Also considering the functions of using cell guides the external measurements of the corners are important.
- The position of corner fittings influences the ship design in space from corners to bulkheads and also the point load of the ships structure.
- Even if cell guides may be adjustable, the mix of cargo has to be considered. There will inevitably be difficulties and loss of space or need of shifting in many conditions.

¹⁴⁹ Pallet-wide cellular containers, i.e. containers with a internal width of 2.42m and an external design fitting into cell guides.

M/S NORDÖN



Type:	Multipurpose LoLo vessel
Built:	2002
Deadweight:	16 600 ton
Holds:	3
Gear:	3 cranes each SWL 37 ton
Container fitted:	Yes, for 20', 40' (and 45' containers on deck)
Cell guides:	No
Hold dimensions:	Length: 24,8 m
	Breadth: 18,8 m (hold no 1 fore part B=13 m)
	Height: 14 m
Capacity TEU:	Hold 1: 120 TEU
	Hold 2: 140 TEU
	Hold 3: 140 TEU
	On Deck: 258 TEU, but if loaded units: only one high (86 TEU)

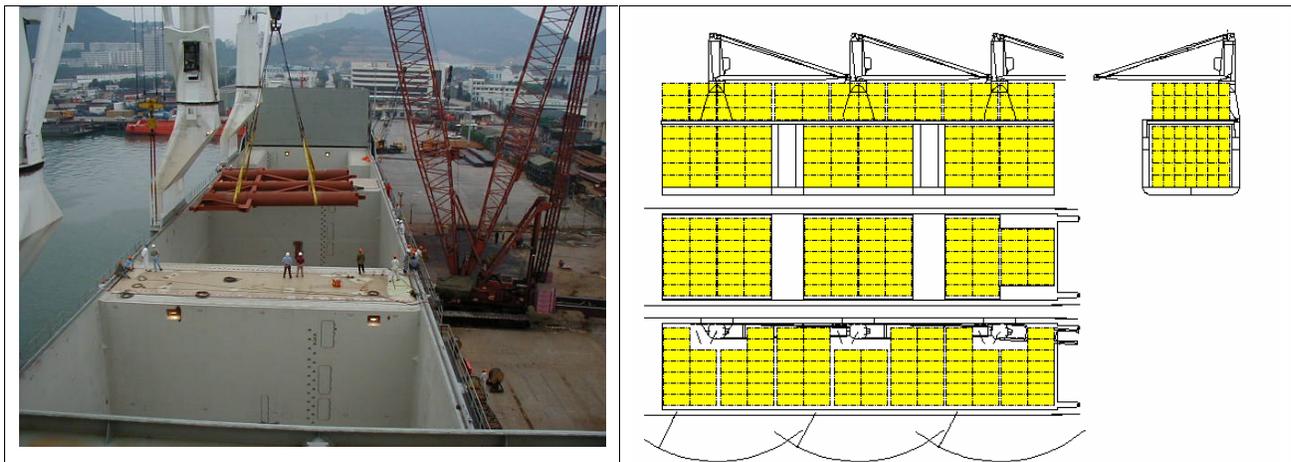


Figure E.1) The photo and the sketch show the cargo hold arrangement.

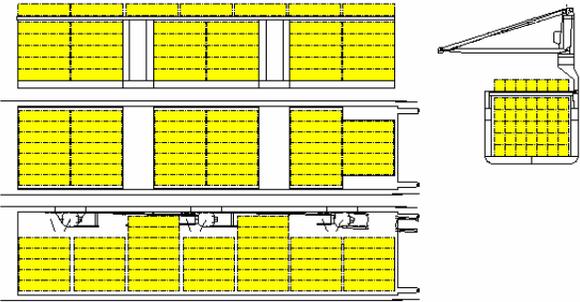
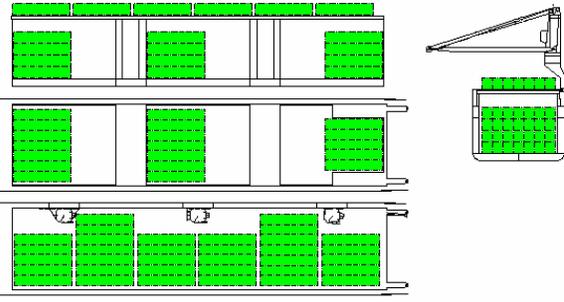
Source: Hallbjörner 2003

Stowage plans have been made for following cases:

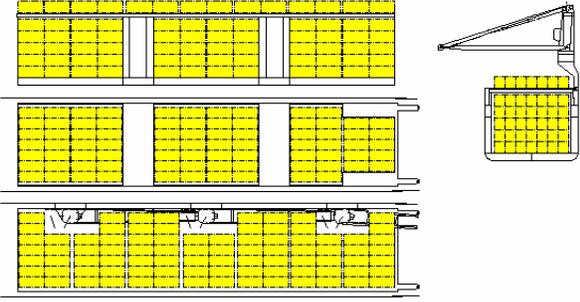
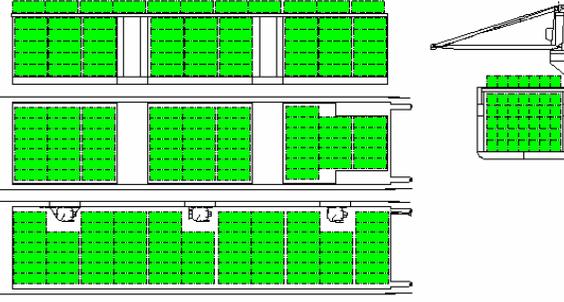
1. Full cargo of 40ft CPCs versus full cargo of long EILUs.
2. Full cargo of 20ft CPCs versus full cargo of short EILUs.
3. Cargo condition with 37% short and 63% long units.

The vessel is not constructed to support the point loads in positions where the EILUs may need this. To do this the inner structure of the vessel must be modified. Anyhow, this aspect is not considered in the stowage plans below but it has an impact on the conclusions.

1. Full cargo of 40ft CPCs versus full cargo of long EILUs.

	
<p style="text-align: center;"><u>40-ft CPCs</u> Number of CPCs: 239 Number of EUR-pallets: 7170</p>	<p style="text-align: center;"><u>Long EILUs</u> Number of EILUs: 110 Number of EUR-pallets: 3630</p>

2. Full cargo of 20ft CPCs versus full cargo of short EILUs.

	
<p style="text-align: center;"><u>20-fots CPCs</u> Number of CPCs: 486 Number of EUR-pallets: 6804</p>	<p style="text-align: center;"><u>Short EILUs</u> Number of EILUs: 366 Number of EUR-pallets: 6588</p>

3. Cargo condition with 37% short and 63% long units.

<p style="text-align: center;"><u>Mix CPCs:</u> Number of 20ft CPCs: 180 Number of 40ft CPCs: 153 Number of EUR-pallets: 7110</p>	<p style="text-align: center;"><u>Mix EILUs</u> Number of Short EILUs: 117 Number of Long EILUs: 105 Number of EUR-pallets: 5571</p>

The total pallet capacity of the vessel using different intermodal loading units is:

Number of europallets	CPCs	EILUs	% increase with CPCs mot EILU
1. Long units only	7170	3630	98%
2. Short units only	6804	6588	3%
3. Mix 37/63	7110	5571	28%

To this vessel the EILU-proposal decreases the pallet capacity with 28%. This happens in case of a pure choice of either type of unit. An EILU would most probably be loaded in a mix with other ISO-containers, resulting in more problems and lost space onboard.

The EILU cause modifications to the vessel:

1. Reinforcement of the cargo hatches corresponding to the position of fittings, or if the existing ones are used (which is possible), and the result would be further lost capacity.
2. Reinforcement of the double bottom tanks corresponding to the position of fittings. The old ISO-positions cannot not be used due to the bulkheads position.
3. Additional container fitting to be fitted.

Appendix V) Recalculation of saving in road vehicles

The EILU-proposal calculates the saving in road vehicles via calculating the number of EILUs needed to transport the same amount of standard pallets as the today's world fleet of ISO containers. This calculation gives a saving on 25% which is used as the main selling argument for the EILU-proposal.

The calculation is not relevant due to following facts:

- The EILU will not be a global tool and therefore the ISO fleet will remain
- The EILU will be shipped in a mix with other containers
- The EILU will be a substitute to (competing with) today's pallet-wide containers, swap-bodies and semi-trailers
- The comparison to the ISO-fleet may only serve one purpose, namely to consider a relevant mix of long and short units, but even so a weak argument as the EU road regulations on length and weight rule
- The choice of a short unit derives from high density cargo, meeting the maximum payload of the loading unit
- The short EILU (7.45m/7.82m) is covering a 40ft position and most probably will be charged accordingly

We recalculate the saving in road vehicle by comparing the EILU towards the today existing pallet-wide containers. The long EILU is competing against the 45ft pallet-wide container, and the short EILU is competing with a 50% of 20ft and 50% of 40ft pallet-wide containers. The different density classes are the following:

High density:	> 2 ton/EUR-pallet position
Medium density:	1-2 ton/EUR-pallet position
Low density:	< 1 ton/EUR-pallet position

We have copied and amended the annexes B and C to the EILU-proposal. Amendments are marked with **bold** type.

Conclusion:

The calculated saving in road vehicles may be judged from different perspectives and from different demand other than the one made in the EILU-proposal. The role of an EILU and its competition to other units must be considered. Our calculations show the pallet-wide containers are as efficient as the EILU. As the pallet-wide container is available today in the same way as the EILU will be tomorrow we doubt that the EILU will cause any saving in road vehicles. The EILU and the today's pallet-wide container should be compared in a wider spectrum.

B - Diagram showing the use of the capacities of EILUs and containers
 Long EILU (effective length of 13.2 m)

Comparative table

	Europallets	UK pallets
Short EILU: internal length of 7.2 m	18	14
20' ISO CPC	14	12
<i>Difference between EILU and ISO</i>	4 (+28%)	2 (+ 17%)
Short EILU: internal length of 7.2 m	18	14
40' ISO CPC	30	24
<i>Difference between EILU and ISO</i>	-12 (-40%)	-10 (-41%)
Long EILU: internal length of 13.2 m	33	26
45' ISO CPC	33	26
<i>Difference between EILU and ISO</i>	0 (+ 0%)	0 (+ 0%)

C - Calculation of saving in road vehicles (port services)

The data used were:

- the composition of the world stock of containers in 1999 (source: AFNOR/H90B), which shows the breakdown of TEU capacity of containers by type: 37.18% for 20' containers, 0.1% for 30' containers, 61.22% for 40' containers and 1.5% for 45' containers.
- DG TREN's 2000 and 2001 statistical pocketbooks, which give:
 - port hinterland container traffic in TEU for 1996 (table 3.4.15) i.e. approx. 16 413 000 TEU.
 - road traffic and the increase between 1996 and 1999.

The following assumptions were made:

- The increase in road services to ports, for containers, between 1996 and 1999 is the same as that for road traffic, in tonne-kilometres, over this period. The volume that has used road transport to serve ports in 1999 can accordingly be estimated at approx. 18.78 million TEU.
- All ILUs are loaded to maximum capacity, with either Euro pallets or UK pallets (and not a mixture of the two types).
- **The pallet capacity of the world fleet of ISO containers is transformed to pallet-wide cargo units.**
- **The saving in number of units is judged using either an EILU or a pallet-wide container (CPC).**

Calculations for road services to ports for containers in 1999.

Type	Containers			allowing the transport of	
	% capacity	TEU	units	europallets (1.2 x 0.8 m)	UK pallets (1.2 x 1 m)
20'	37.18 %	6 982 404	6 982 404	76 806 444	62 841 636
30'	0.10 %	18 780	12 520	237 880	187 800
40'	61.22 %	11 497 116	5 748 558	143 713 950	126 468 276
45'	1.5 %	281 700	125 200	4 131 600	3 255 200
Totals	100 %	18 780 000	12 868 682	224 889 874	192 752 912

Taking into account the theoretical pallet capacity of the EILUs, the number of EILUs of each type required to transport the pallets can be worked out by distinguishing the types of container. The results differ according to whether europallets or UK pallets are being transported. To be on the safe side, we will use the worst case scenario, i.e. the larger of the two numbers of EILUs resulting from the calculations. **A total number of 224 889 874 Euro-pallets or 192 752 912 UK-pallets are to be moved. Judged from the above composition, 40% is high or medium density and 60% is low density volume cargo. The effect using either EILUs or CPCs is calculated:**

Number of EILUs

Cargo category	EUR-pallets	UK-pallets	Type	EUR-pallets	UK-pallets	Maximum
High density (20%)	44 977 975	38 550 582	Short	2 498 776	2 753 613	2 753 613
Medium density (20%)	44 977 975	38 550 582	Short	2 498 776	2 753 613	2 753 613
Low density (40%)	134 933 924	115 651 747	Long	4 088 907	4 448 144	4 448 144
Total number of units	224 889 874	192 752 912				9 955 370

Number of CPCs

Cargo category	EUR-pallets	UK-pallets	Type	EUR-pallets	UK-pallets	Maximum
High density (20%)	44 977 975	38 550 582	20'CPC	3 212 712	3 212 549	3 212 712
Medium density (20%)	44 977 975	38 550 582	40'CPC	1 499 266	1 606 274	1 606 274
Low density (40%)	134 933 924	115 651 747	45'CPC	4 088 907	4 448 144	4 448 144
Total number of units	224 889 874	192 752 912				9 267 131

Saving CPC/EILU: 688 239 7%

If all cargo in the world would be palletised the reduction of cargo units, by using pallet-wide containers, would be substantial, either by using today's pallet-wide ISO container or the EILU. The choice of unit length depends on volume needed (density of cargo) and may affect the number of units handled. The mixture above shows a benefit of the CPCs (7%).