Lecture 4
The Container

THE CONTAINER

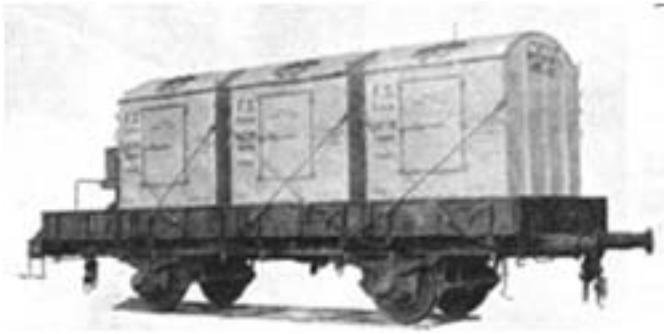
Section 1 **Emergence of the ISO Container**

Section 2 **The ISO Container**

EMERGENCE OF ISO CONTAINERS
1925 – AUSTRALIAN RAILWAYS

EMERGENCE OF ISO CONTAINERS
WORLD CONGRESS 1928

- World Congress 1928 held in Rome
  - Container Commission established
- 1933 replaced by International Container Bureau joint body of:
  - International Chamber of Commerce
  - Union of Railways (UIC)
  - Meet 4 times a year (except war years)
- Largely concerned with European railways



EMERGENCE OF ISO CONTAINERS
1929 SEATRAIN LINES

- 1929 began hauling rail cars by ship from the port of New York to Havana, Cuba
- 2 ships Seatrain New York and Seatrain Havana
  - Length130 m, DWT 10,500
  - Capacity of 100 railcars on 4 decks
  - Load and unload in 10 hours
- Service continued until early 1960s (ended due to USA - Cuba politics)
- Sought to redeploy ships to New York to Puerto Rico but poor rail in Puerto Rico

EMERGENCE OF ISO CONTAINERS
+1930s UK RAILWAYS

EMERGENCE OF ISO CONTAINERS
1950s USA STRICK-TAINER

- 1950s first ship cargo container used in international trade
- 1960s evolved into Flexi-Van container system
  - Used by New York Central Railroad
  - Road-Rail-Unit with bottom container castings

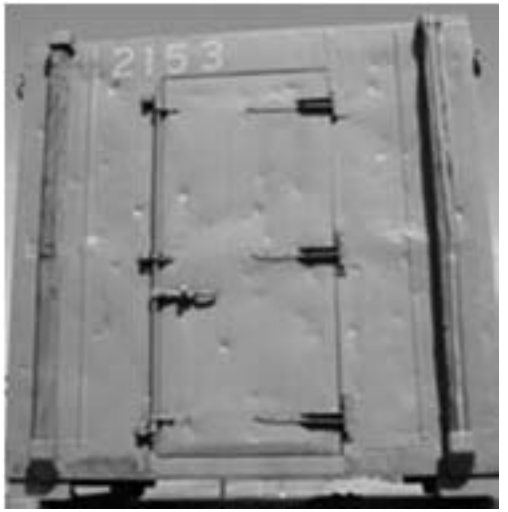
EMERGENCE OF ISO CONTAINERS
KOREAN WAR - CONEX

- Problem
  - Port of Pusan
  - Korean stevedores dropping and broke about 90% of crates
  - Theft and pilferage common
  - Army lost about 10% of all cargo
- CONEX Box 1952
  - Reduce port pilferage and breakage
  - Reduced transport time from 55 days to 27 days

EMERGENCE OF ISO CONTAINERS
1968 – LIVERPOOL TO NEW YORK

EMERGENCE OF ISO CONTAINERS
1955 - WHITE PASS AND YUKON

- Clifford J. Rodgers
  - Purpose built continer ship (Montreal 1955)
  - 600 steel containers
    - 8ft by 8ft
    - 5 tons capacity
- November 26, 1955 - Intermodal container system
  - North Vancouver, British Columbia to Skagway, Alaska
  - Transported on purpose built rail wagons and trucks
  - Transport north inland to the Yukon
  - Transported to consignee without opening



Containers were loaded by fork-lifts to specially-designed low-bed trailers for movement from Whitehorse as early as 1953.

EMERGENCE OF ISO CONTAINERS
SEALAND 1937 TO 1954

- Malcolm McLean (Scottish American) – a trucker
  - Bought a second hand truck. In 1937
  - Business grew to 1800 trucks
  - Long distance trucking
- USA is a federal country each state collects its own taxes
  - Truck trailers paid a tax each time enters another state
  - A long haul could cross 12 states
  - 2 x tax payments at the border crossing
- Known for innovation and he was frustrated that
  - 1 day to unload a truck carrying breakbulk cargo
  - Dock pallets loaded one at a time and manually stowed
- 1954 designed system for loading and unloading
  - Body of truck removed from chassis and loaded on ship
  - Body of truck unloaded from ship and put on a new chassis
- Sending by ship would save
  - Taxes
  - Handling time
  - Damage and thefts

EMERGENCE OF ISO CONTAINERS
SEALAND 1955 - MALCOM MCLEAN

- Sold trucking business for $6 million
- Bought a shipping company
  - Pan-Atlantic Steamship Line (would become Sea-Land)
- Converted a 1944 T-2 tanker ship (Ideal X)
  - Deck added with slots to secure 58 units (35ft)
  - Also able to carry 15,000 tons of petroleum

EMERGENCE OF ISO CONTAINERS
SEALAND 1956 - MALCOM MCLEAN

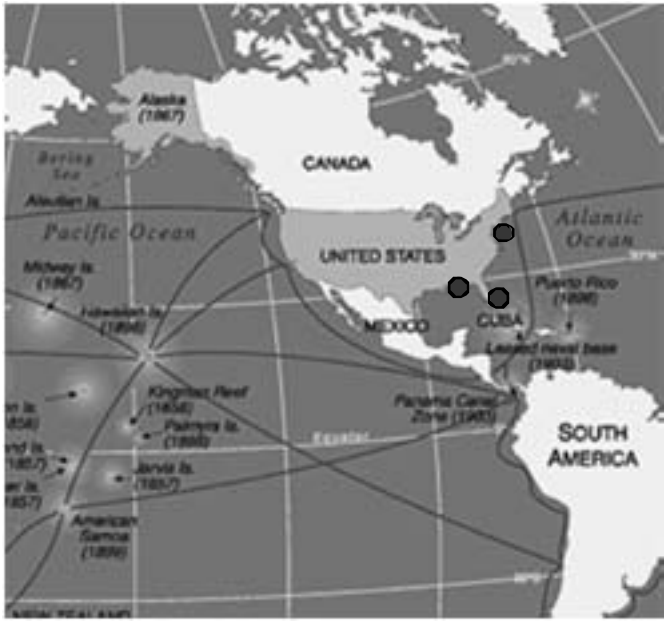
- 26 April Ideal X's first sailing
- Port Newark (New Jersey) to Houston
- Deck had slots for 58 units (35ft long)
- Arrived in Houston 6 days later
  - Units unloaded onto chassis on quay
  - Existing port cranes were used
  - No handling of cargo by longshoremen (US port workers)
- Cost of stowage
  - Breakbulk ship = US$ 5.80 per ton
  - Ideal X = US$ 0.16 per ton
  - 36 times less

EMERGENCE OF ISO CONTAINERS
SEALAND 1957 - MALCOM MCLEAN

- Ideal X soon proved the success of the concept
- Bought World War 2 C2 type general cargo ship
  - Converted into container ships
  - Ideal X was sold (scrapped in 1964)
- Gateway City first cellular container ship
  - Length 137m
  - Beam 22m
  - Draft 7.6m
  - Speed of 15 knots
  - Capacity of 226 units (35 ft) = 395 TEU
- 5 Sister ships also converted in 1957
  - Azalea City
  - Bienville
  - Fairland
  - Raphael Semmes
  - Beauregard
- Geared cellular ships with stacked containers
- Had to use stackable containers!

EMERGENCE OF ISO CONTAINERS
SEALAND 1957 - MALCOM MCLEAN

- Crew (25)
  - 1 Captain
  - 1 Chief Engineer & 1 radioman
  - 1 Pursar
  - 6 Able-bodied & 3 ordinary seamen
  - 1 Bosun & 1 maintenance man
  - 3 Firemen & 1 wiper (engine room)
  - 1 Cook & 2 stewards
  - 3 Mates (1st, 2nd and 3rd)
- First sailing Port Newark to Miami
  - 165 units Newark to Houston
  - 61 units Newark to Miami
  - 3 units Miami to Houston
  - At Houston
    - 08:18 first unit unloaded
    - 08:20 first unit left port
    - 08:30 first unit delivered to shipper in Miami
- Regular service
  - Newark – Miami – Houston – Tampa
  - Loading & unloading = 264 tons of cargo an hour



Source: http://ravenofferings.blogspot.kr/2010/05/notes-from-ss-fairland.html

EMERGENCE OF ISO CONTAINERS
SEALAND 1958 – SERVICE EXPANDED

- Sea-Land introduces container service to Puerto Rico
  - Service Newark - San Juan (Puerto Rico)
  - SS Fairland

EMERGENCE OF ISO CONTAINERS
MATSON NAVIGATION - 1956

- Matson Navigation
  - 1882 first service San Francisco to Hilo (Hawaii)
  - Operated cargo ships, passengers ships and terminals
- 1956 researched introduction of containers
- 1958 Hawaiian Merchant
  - Converted a C3 type 1945 built general cargo ship
  - Carry 20 containers on deck (24ft containers)
  - Breakbulk under deck

EMERGENCE OF ISO CONTAINERS
MATSON NAVIGATION - 1958

- 31st August 1958 Hawaiian Merchant leaves (Alameda) San Francisco Bay
- Alameda – Honolulu, Hawaii
- Cargo of 20 x 24 ft containers on deck

- Sea- land = 35ft long containers
- Matson = 24 ft long containers

EMERGENCE OF ISO CONTAINERS
DEVELOPMENT OF DIFFERENT SOLUTIONS

- North America
  - Domestic trade to islands and Alaska
  - SeaTrains
    - Rail wagon load units
    - Purpose built ship
  - Conex
    - Military containers (Korean war)
  - White Pass – Yukon
    - 8ft x 8ft containers
    - Purpose built ship
  - Sea-Land
    - 35ft stackable units based on bodies
    - Based on truck length
    - Converted ships
  - Matson Navigation
    - Adapted ships
    - 24 ft units suited to Hawaiian trade route
- Elsewhere
  - Range of swap body solutions
  - Based on rail wagons







EMERGENCE OF ISO CONTAINERS
DEVELOPMENT OF DIFFERENT SOLUTIONS

- Concept had been proven
- Issues
  - Each solution was independent
    - Different dimensions
    - Similar but different lifting methods and fittings
  - No International trade had begun
  - Port infrastructure represented a challenge

EMERGENCE OF ISO CONTAINERS
ASA – 1958 STANDARDS

- 1958 American Standards Association (ASA)
  - 2 committees held separate meetings to agree container dimension standards
  - Held in November 1958 over 2 days
  - Materials Handling 5 (MH-5)
- Membership dominated by
    - Trucking companies
    - Railroads
    - Trailer manufacturers
  - Sea-Land and Matson only shipping lines using “containers”
    - Were not part of the discussions
    - Resisted MH-5 standard
- Agreed family of acceptable standards for US domestic containers
  - 8ft width based on road regulation
    - At the time this was too wide for many European railways
  - Height maximum of 8½ ft agreed
    - Maritime members favoured 8ft
    - Trucking members favoured 8½ ft
  - Agreed 3 pairs of container lengths
    - 20/40 ft (40 ft based on railway maximum)
    - 12/24 ft - based on west coast USA shipping line Matson)
    - 17/35 ft – based on trailer length allowed in all states

EMERGENCE OF ISO CONTAINERS
NATIONAL DEFENCE TRANS ASSOC- 1959

- National Defence Transportation Association
  - A USA association of companies handling military cargo
  - Decided to study container dimensions
  - No shipping companies were members
- 1959 it had agreed standard containers
  - 20 ft and 40 ft long
  - 8 ft wide
  - 8 ft high
  - Would not accept for military cargo
    - ASA standards of 8½ high or different lengths
- US military cargo
  - Very valuable source of revenue for transport companies
  - Domestic movements
  - Overseas USA military bases

EMERGENCE OF ISO CONTAINERS
1961 - VIETNAM WAR

EMERGENCE OF ISO CONTAINERS GLOBAL STANDARDS

- April 1963 compromise agreed
- There were issues over transport modes
  - Railway infrastructure – tunnels, wagons etc
  - Road networks – national regulations on truck sizes
  - Ports – ability to handle container dimensions and fittings
  - Ships – container ships were already built for different sizes
- There were issues of the container design
  - There was a growing number of containers
    - Railways
    - Shipping companies
    - Trucking companies
  - They had
    - Different sizes
    - Different strengths
    - Different methods of lifting
    - Different stacking limits
- Many countries involved
  - European, British, North American, Japan

EMERGENCE OF ISO CONTAINERS
1966 EXPERIMENT TILBURY LONDON

EMERGENCE OF ISO CONTAINERS
1967 - SEATRAIN LINES

- Converted 2 x T2 tanker ships
- Newark-Puerto Rico service
- Converted T2 tankers and C2 ships to carry containers
- Length 165m
- Under deck carried rail and lorries
- 2 x 50 ton cranes to unload under deck cargo
- Used 40ft container units

Seatrain Puerto Rico

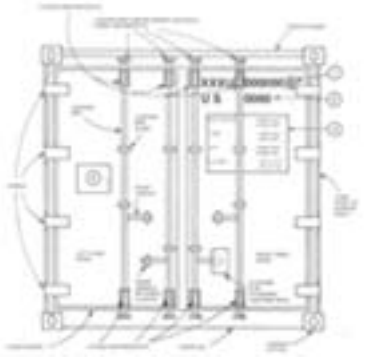
EMERGENCE OF ISO CONTAINERS
ISO CONTAINERS – THE ISO

- Non-governmental organisation (NGO)
  - Based in Switzerland
  - Produces voluntary industry standards (not just transport)
  - Established in 1947
  - “To promote the development of standardization and related activities in the world with a view to facilitating the international exchange of goods and services, and to developing cooperation in the spheres of intellectual, scientific, technological and economic activity.”
- During the 1960s ISO sought to develop global standards for containers

ISO International Organization for Standardization

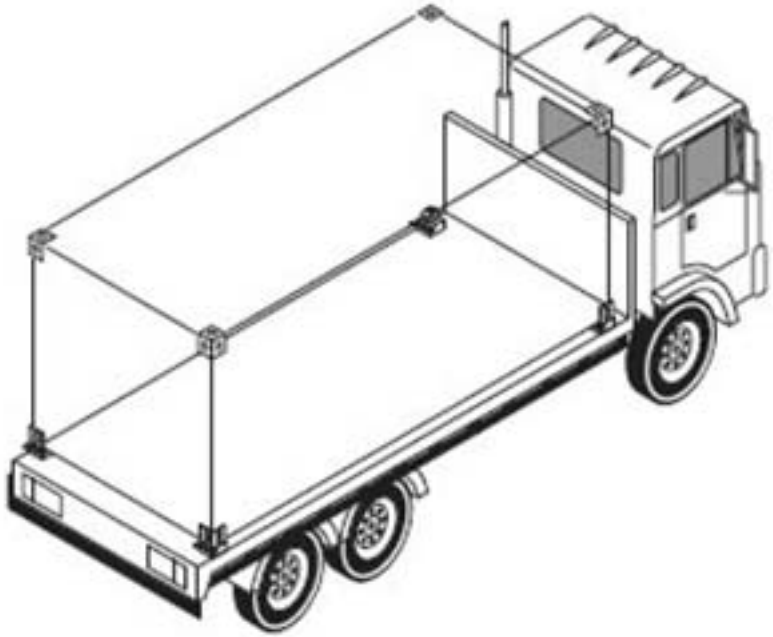
EMERGENCE OF ISO CONTAINERS
ISO STANDARDS – TC 104

- 1968 standards issued
- Today 3 standards + 1 underdevelopment
  - TC 104/SC 1 - General purpose containers
  - TC 104/SC 2 - Specific purpose containers
  - TC 104/SC 4 - Identification and communication#
  - Under development: Freight containers -- Mechanical seals
- 28 participating countries and 24 observing countries
- Liaises with
  - United Nations bodies eg
    - International Labour Organization (ILO)
    - International Maritime Organization (IMO)
  - Non-governmental organizations (NGOs) eg
    - ICHCA International
    - International Container Bureau (ICB)
    - International Chamber of Shipping (ICS)
  - International governmental organizations (IGOs) eg
    - World Customs Organization
    - European Commission
  - Trade associations eg
    - Asian Packing Federation (APF)

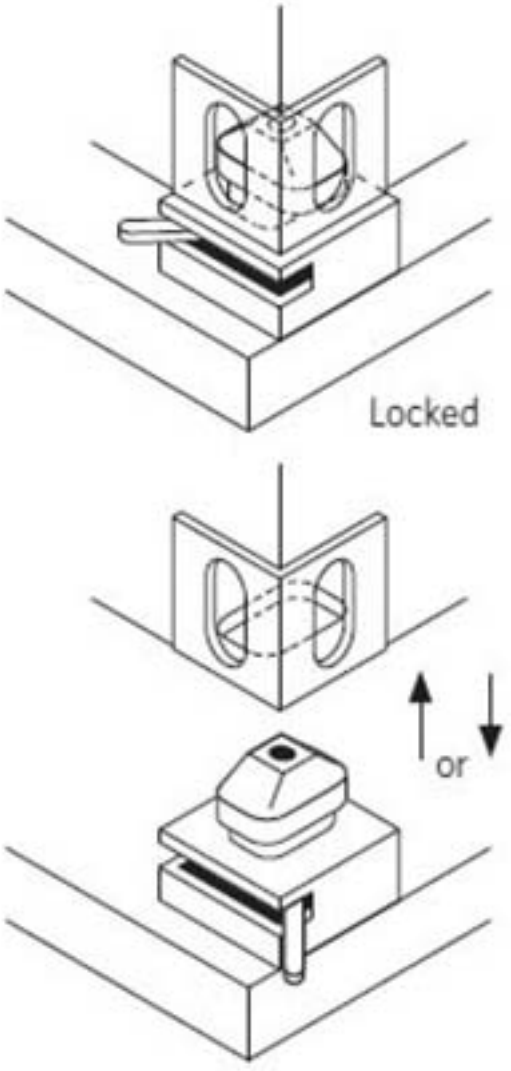


ISO International Organization for Standardization

EMERGENCE OF ISO CONTAINERS
OPEN TECHNOLOGY

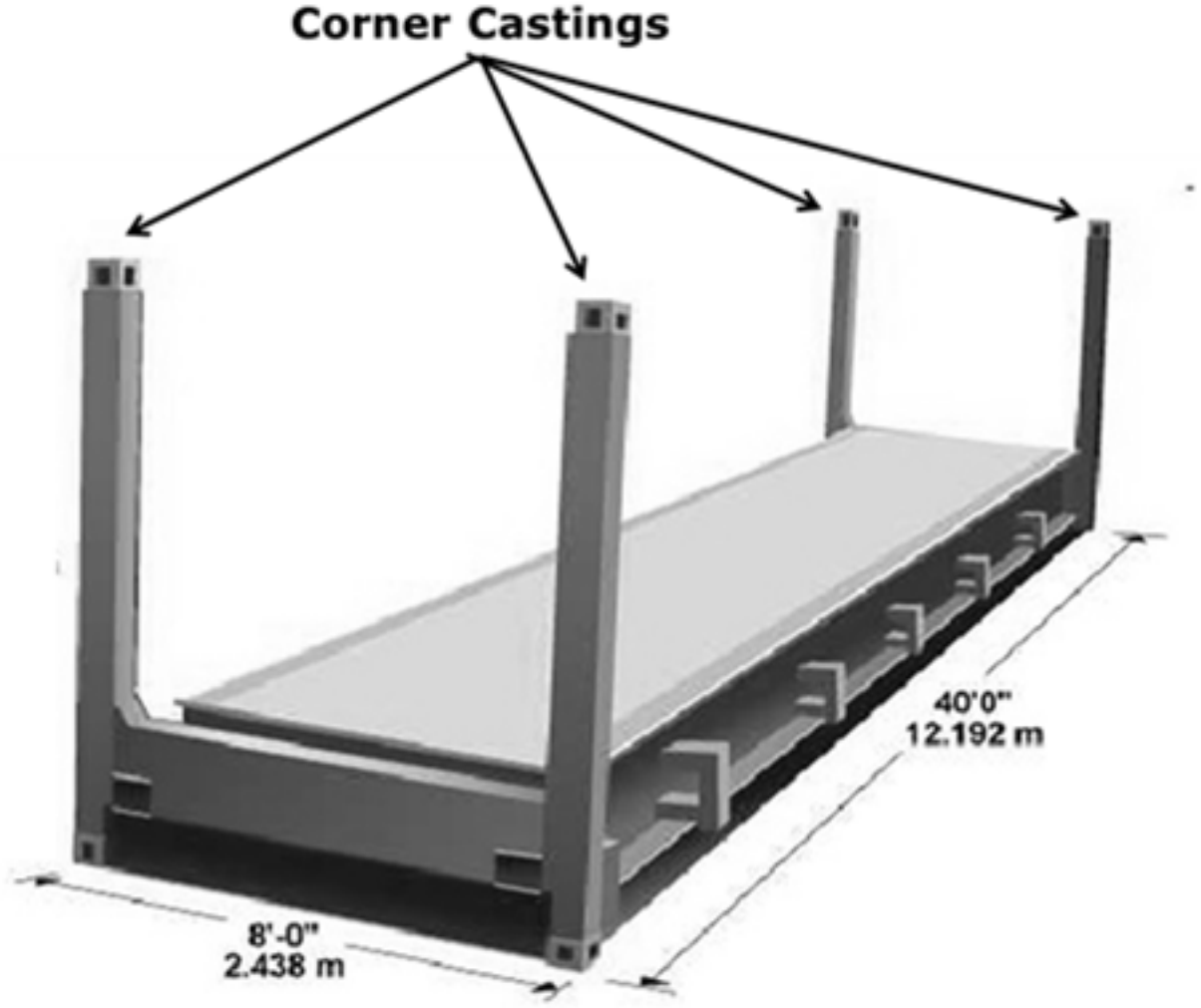


Unlocked, container may be
lowered onto or removed from truck



EMERGENCE OF ISO CONTAINERS
OPEN TECHNOLOGY

EMERGENCE OF ISO CONTAINERS
STRENGTH OF CONTAINERS



THE CONTAINER

Section 1 **Emergence of the ISO Container**

Section 2 **The ISO Container**

THE ISO CONTAINER
ISO 668:1995 – DIMENSIONS

- ISO 668:1995 Classification, dimensions and ratings
  - Amd 1:2005 – updates including structures and goosenecks
  - Amd 2:2005 - 45 containers
- Dimensions
  - External ± tolerances
  - Minimum internal
  - Minimum door opening
- Locations of corner fittings
- Load bearing structures
  - Locations
  - Strengths

Figure B.6 — 1AA, 1A or 1AX containers without gooseneck tunnel — Minimum requirements

Table 2 — External dimensions, permissible tolerances and ratings for series 1 freight containers

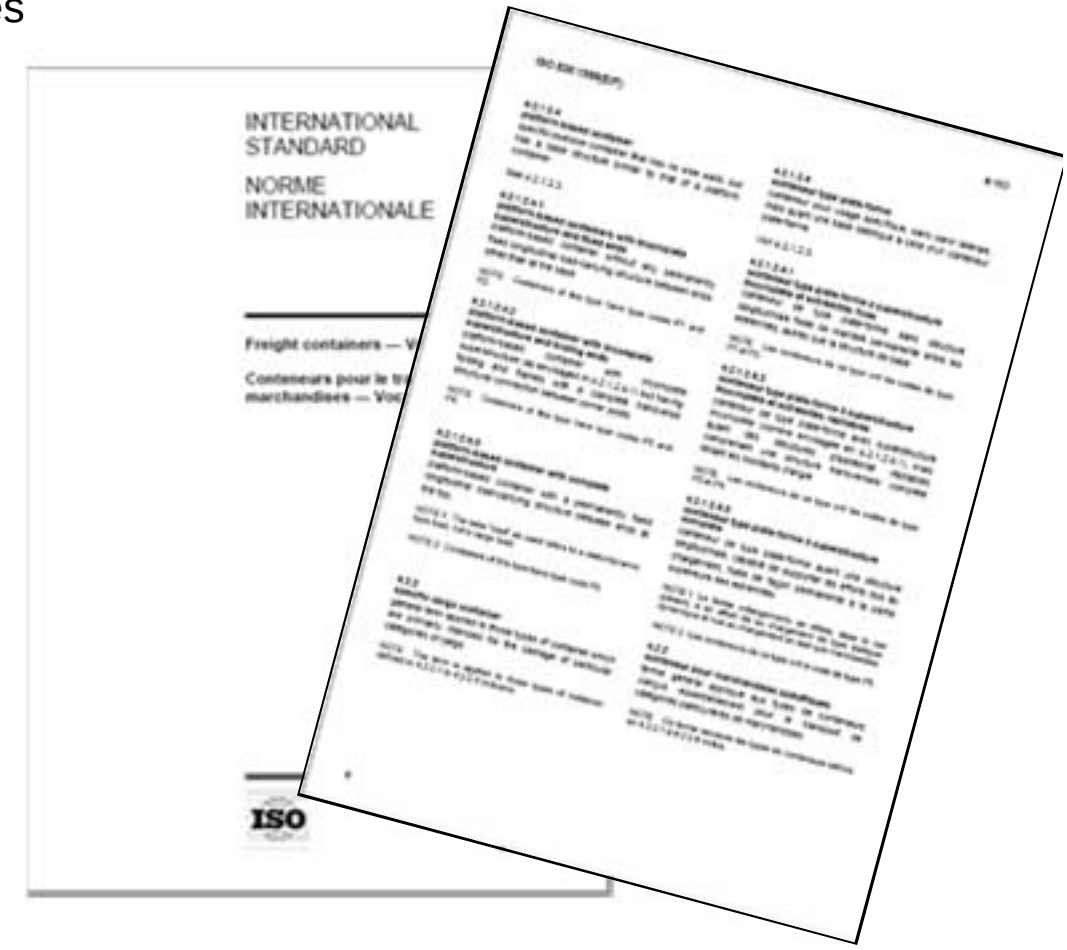
Freight container designation	Length, *L*				Width, *W*				Height, *H*				Rating, *R*[a] (gross mass)	
	tol.		tol.		tol.		tol.		tol.		tol.			
	mm		ft in	in	mm		ft	in	mm		ft in	in	kg	lb
1EEE	13 716[b]	0 −10	45	0 −3/8	2 438	0 −5	8	0 −3/16	2 896[b]	0 −5	9 6[b]	0 −3/16	30 480[b]	67 200[b]
1EE									2 591[b]	0 −5	8 6[b]	0 −3/16		
1AAA	12 192	0 −10	40	0 −3/8	2 438	0 −5	8	0 −3/16	2 896[b]	0 −5	9 6[b]	0 −3/16	30 480[b]	67 200[b]
1AA									2 591[b]	0 −5	8 6[b]	0 −3/16		
1A									2 438	0 −5	8	0 −3/16		
1AX									< 2 438		< 8			
1BBB	9 125	0 −10	29 11 1/4	0 −3/8	2 438	0 −5	8	0 −3/16	2 896[b]	0 −5	9 6[b]	0 −3/16	30 480[b]	67 200[b]
1BB									2 591[b]	0 −5	8 6[b]	0 −3/16		
1B									2 438	0 −5	8	0 −3/16		
1BX									< 2 438		< 8			
1CC	6 058	0 −6	19 10 1/2	0 −1/4	2 438	0 −5	8	0 −3/16	2 591[b]	0 −5	8 6[b]	0 −3/16		
1C									2 438	0 −5	8	0 −3/16		
1CX									< 2 438		< 8			
1D	2 991	0 −5	9 9 3/4	0 −3/16	2 438	0 −5	8	0 −3/16	2 438	0 −5	8	0 −3/16	10 160	22 400
1DX									< 2 438		< 8			

[a] See 5.2.2.

[b] In certain countries there are legal limitations to the overall height of vehicle and load (for example for railroad service).

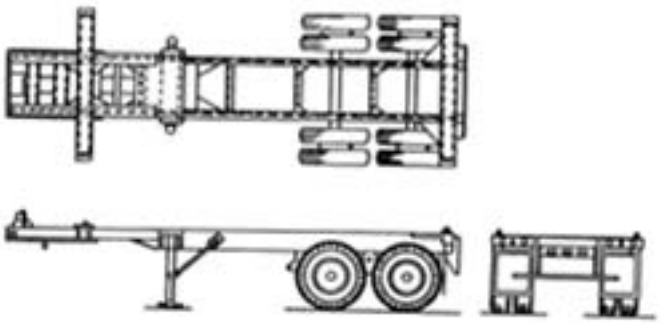
THE ISO CONTAINER
ISO 830:1999 - VOCABULARY

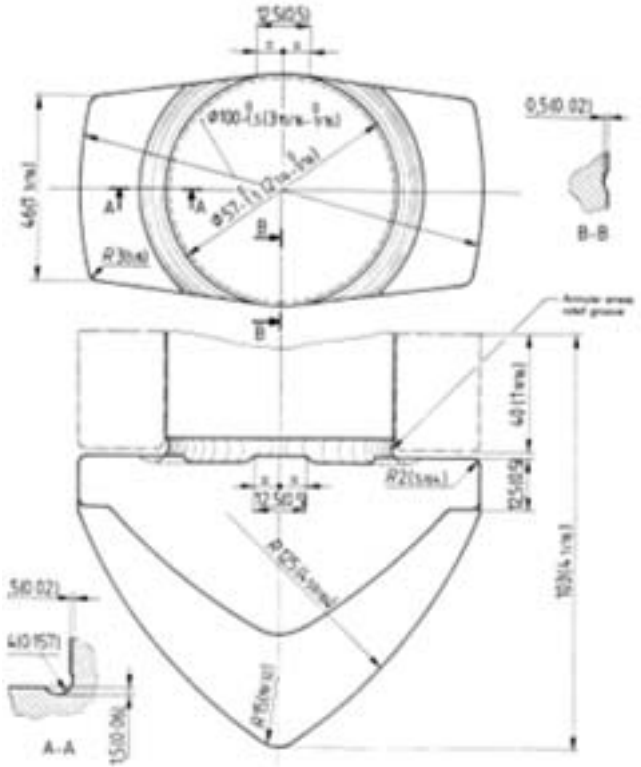
- ISO 830:1999 Vocabulary
  - Cor 1:2001
- Definitions
  - Container types
  - Related to dimensions and capacities
  - Related to ratings and masses
  - Components and structures
  - Handing and securing
  - Visual identification

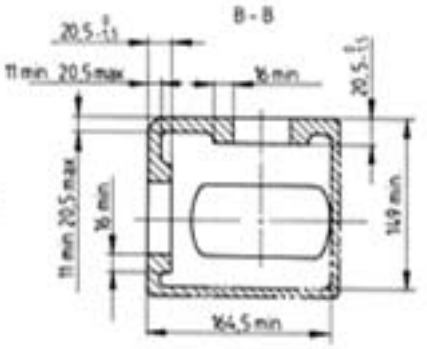


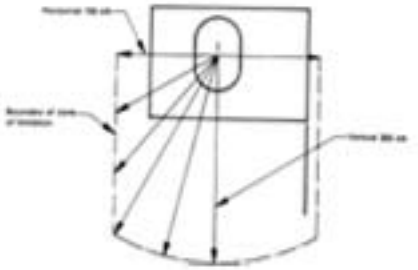
THE ISO CONTAINER
ISO 1161: 1984 – CORNER FITTING

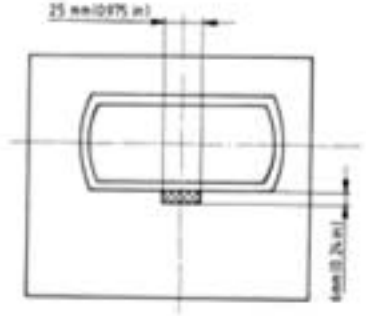
- ISO 1161:1984 Corner fittings – Specification
  - Cor 1:1990
  - Amd 1:2007 - 45 ft containers
- Dimensions
- Strength
- Design
- Minimum load bearing area
- Corner fitting marking











THE ISO CONTAINER
ISO 1496:1990 – SPECIFICATIONS

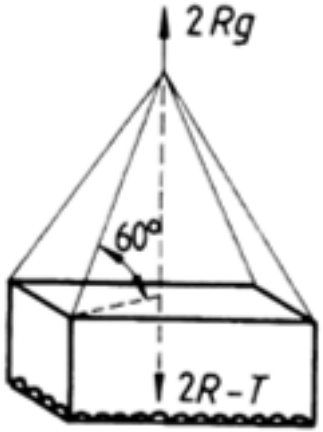
- ISO 1496 Specification and testing
  - -1:1990 General cargo containers for general purposes
    - Amd 1:1993
    - Amd 2:1998
    - Amd 3:2005
    - Amd 4:2006
    - Amd 5:2006 - Door end security
  - -2:2008 Thermal containers
  - -3:1995 Tank containers for liquids, gases and pressurized dry bulk
    - Amd 1:2006 - Testing of the external restraint (longitudinal) dynamic
  - -4:1991 Non pressurized containers for dry bulk
    - Amd 1:1994 - 1AAA and 1BBB containers
    - Cor 1:2006
  - -5:1991 Platform and platform-based containers
    - Amd 1:1993 - 1AAA and 1BBB containers
    - Amd 2:1994
- Contents
  - Dimensions, ratings and design
  - Testing
  - Diagrammatic representation of capabilities
  - Dimensions of fork-lift pockets
  - Cargo securing systems

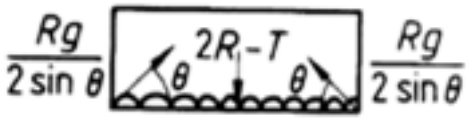
THE ISO CONTAINER
ISO 1496:1990 - TESTING

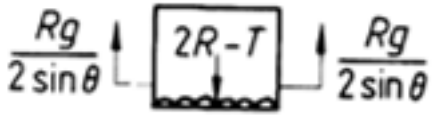
- General container type tests
  - Test 1: Stacking
  - Test 2: Lifting from the four top corner fittings
  - Test 3: Lifting from the four bottom corner fitting
  - Test 4: Restraint (longitudinal)
  - Test 5: Strength of end walls
  - Test 6: Strength of side walls
  - Test 7: Strength of the roof
  - Test 8: Floor strength
  - Test 9: Rigidity (transverse)
  - Test 10: Rigidity (longitudinal)
  - Test 11: Lifting by fork-lift pockets
  - Test 13: Weatherproofness
- Thermal container tests
- Tank container tests
  - Pressurized
  - Non-pressurized
- Platform container tests
- Internal cargo securing components

Table 3 — Forces to be applied in stacking test

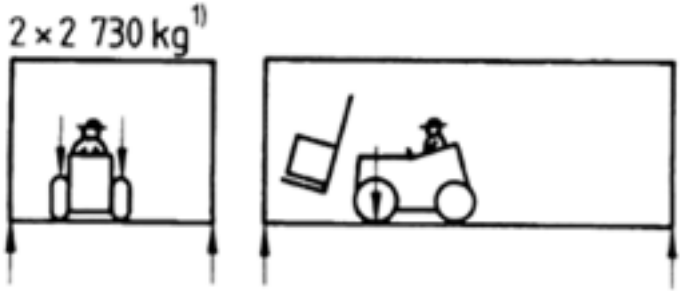
Container designation	Test force per container (all four corners simultaneously)		Test force per pair of end fittings		Superimposed mass represented by test force	
	kN	lbf	kN	lbf	kg	lb
1A, 1AA, 1AAA and 1AX	3 767	762 550	1 883	381 275	213 360	470 380
1B, 1BB, 1BBB and 1BX	3 767	762 550	1 883	381 275	213 360	470 380
1C, 1CC and 1CX	3 767	762 550	1 883	381 275	213 360	470 380
1D and 1DX	996	201 600	449	100 800	50 800	112 000





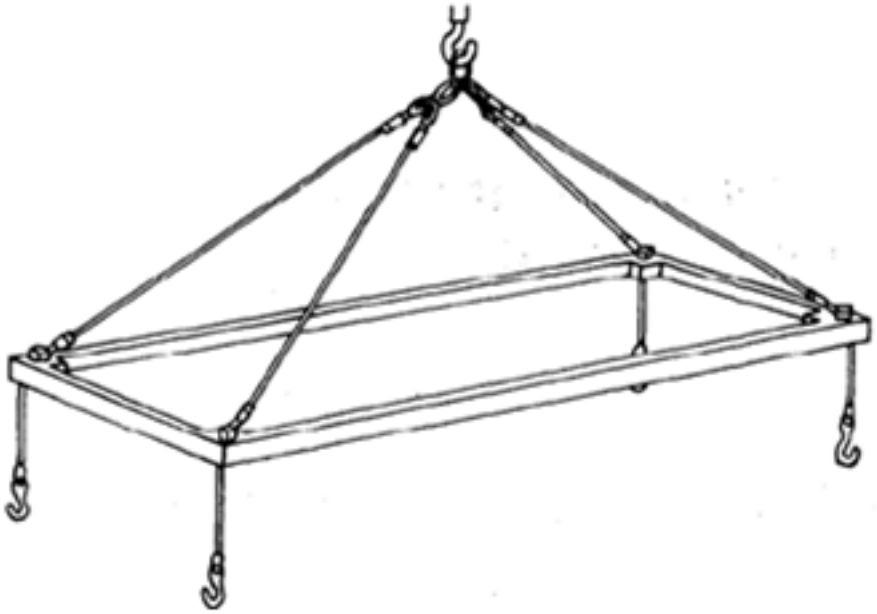


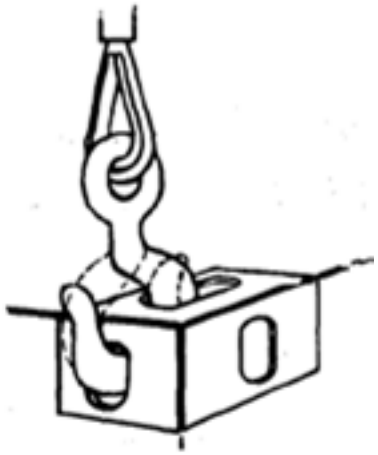
Test No. 8

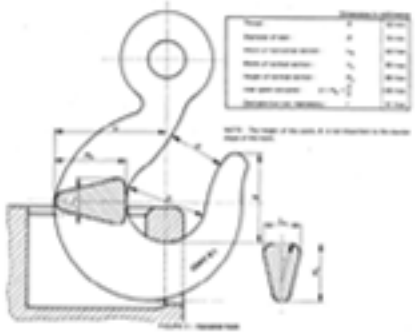


THE ISO CONTAINER
ISO 2308: 1972 – HANDLING

- ISO 2308:1972 Hooks for lifting freight containers of up to 30 tons capacity

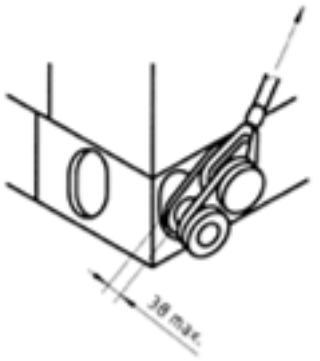


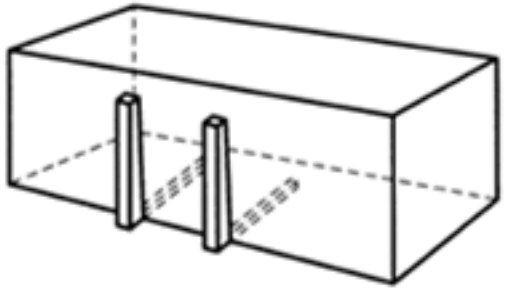




THE ISO CONTAINER
ISO 3874: 1997 - HANDLING

- ISO 3874:1997 Handling and securing
  - Amd 1:2000 - Twistlocks, latchlocks, stacking fittings and lashing rod systems
  - Amd 2:2002 - Vertical tandem lifting
  - Amd 3:2005 - Double stack rail car operations
  - Amd 4:2007 - 45 ft containers
- Contents
  - Packing, loading and emptying
  - Stowage and securing cargo
  - Lifting methods
  - Top lift spreaders
  - Top lift sling
  - Botton lift sling
  - Side lift (methods 1, 2 and 3)
  - End lift (methods 1 and 2)
  - Fork lifts
  - Landing and supporting
  - Stacking on the ground (including wind speed)
  - Securing during transport (ship, road, rail)
  - Twistlocks (dimensions, strength and testing)
  - Latchlocks (dimensions, strength and testing)
  - Stacking fittings (dimensions, strength and testing)
  - Lashing rods (dimensions, strength and testing)





THE ISO CONTAINER
ISO 3874: 1997 - HANDLING

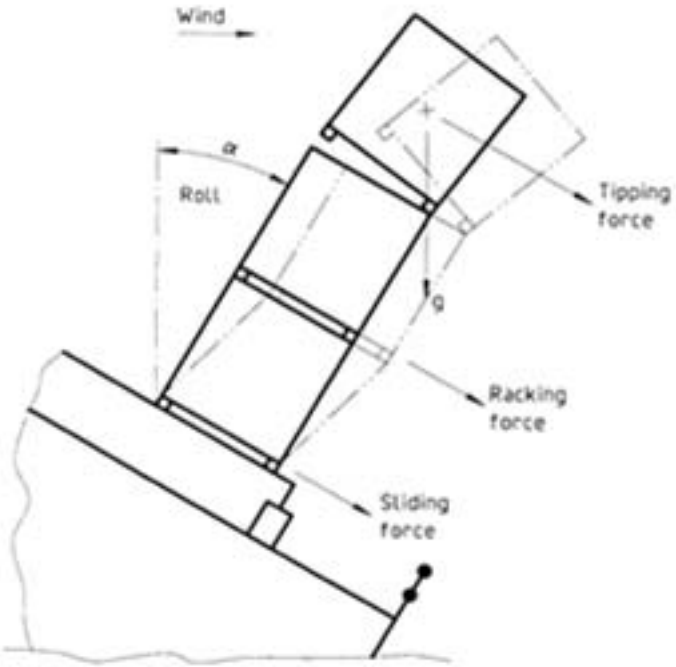


Figure 17 — Racking, tipping and sliding

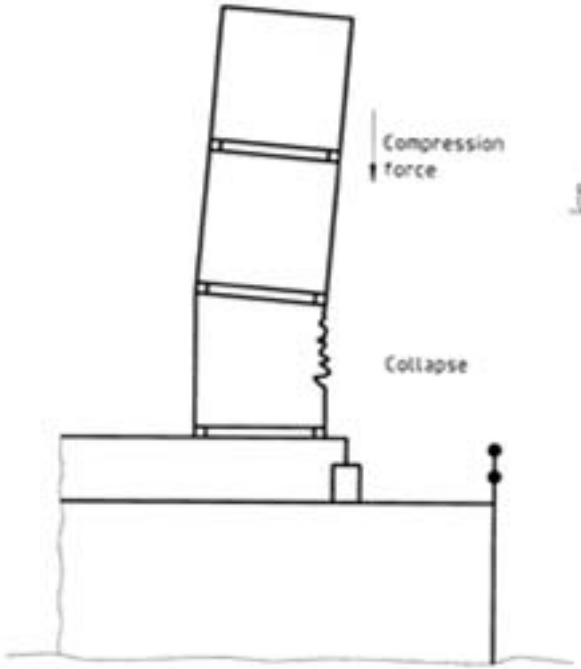
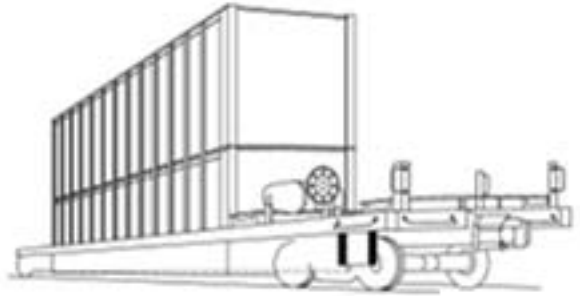
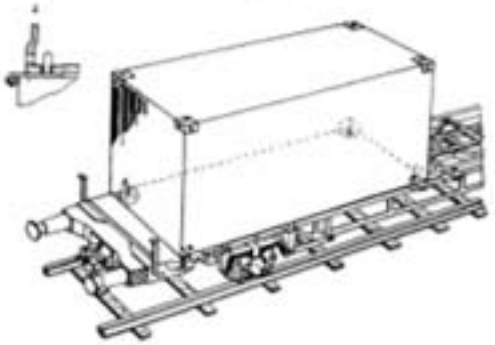


Figure 18 — Compression and collapse

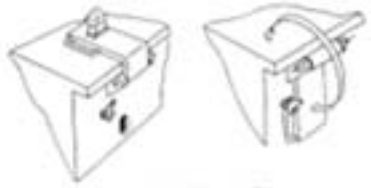


a) Overall view of a typical double stack rail car

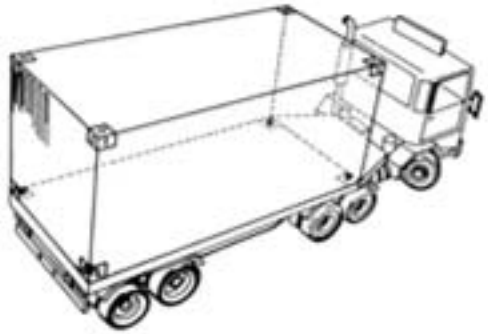
b) Detail of securing fitting



a) Overall view of a typical railway wagon

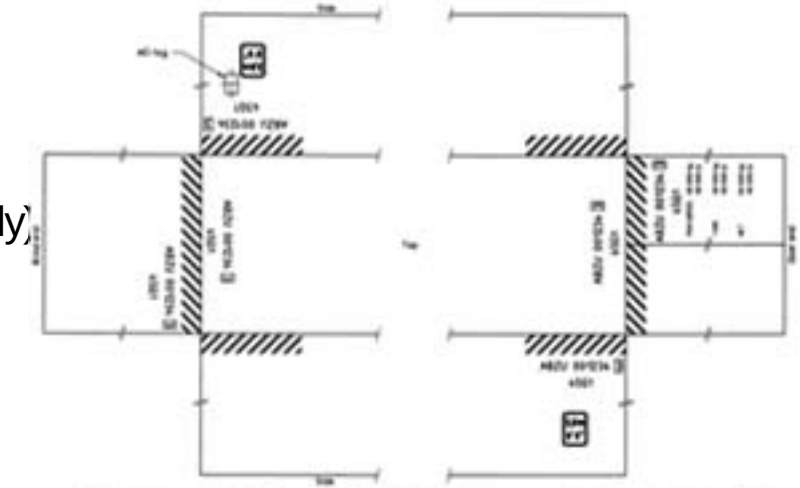


b) Detail of securing fitting



THE ISO CONTAINER
ISO 6346: 1995 – CODING, ID, MARKS

- ISO 6346:1995 - Coding, identification and marking
- Visual identification system for every container
- Unique container code
  - Owner – 3 letter alpha code (1700+ owners globally)
  - Equipment category – 1 letter alpha code
    - U = container
    - J = detachable equipment for containers
    - Z = trailer or chassis for containers
  - Serial number - 7 digits (includes check digit)
- Country code (optional)
- Size & type (since 1996)
- Operational marks
  - Air surface container
  - Overhead electrical danager
  - Height max
- Managed by the International Container Bureau (BIC) - www.bic-code.org



THE ISO CONTAINER
ISO 6346: 1995 – CONTAINER NUMBER

BSIU2253788

Owner

Serial Number

Check Digit

U = container
J = detachable equipment for containers
Z = trailer or chassis for containers

THE ISO CONTAINER
ISO 6346: 1995 – CONTAINER OWNER

BSIU2253788

prefix	slt	name	origin	owner
BRUU	t	btc	BN	Brunei Transporting Company
BSBU	l	bigsteelbox	CA	Big Steel Box ltd.
BSCU	s	bsc	RU	Baltic Shipping Company
BSGU	s		UA	Black Sea Shipping Service ltd.
BSHU	s		IN	Best Express Shipping Transport pvt. ltd.
BSIU	l	blue sky	GB	Blue Sky Intermodal (uk) ltd.
BSLU	s		GB	A.P. MollerMaersk Group
BSLU	o		HK	BSL Containers
BSMU	t	brian smith	GB	E.E. & Brian Smith
BSTU	l	best	NL	Best Containers Purmerend bv.
BSWU	o	bison	GB	Bison Concrete Products ltd.
BTCU	t			Bulkmatic Transport co
BTEU	t	bruhn	DE	Bruhn Spedition
BTIU			FR	Interarmees commissariat

www.prefixlist.com

THE ISO CONTAINER
ISO 6346: 1995 – CONTAINER LENGTH

First character = length
Second character =width and height
Third and fourth character = type

22G1

First Character

1 = 10 feet	G = 41 feet
2 = 20 feet	H = 43 feet
3 = 30 feet	L = 45 feet
4 = 40 feet	M = 48 feet
B = 24 feet	N = 49 feet
C = 24 feet 6 inch	

THE ISO CONTAINER
ISO 6346: 1995 – WIDTH & HEIGHT

First character = length
Second character =width and height
Third and fourth character = type

22G1

2nd Character code					
Container height			Container width		
mm	ft	in	2438 mm (8ft)	>2438 mm and ≤ 2500 mm	>2500 mm
2438	8		0		
2591	8	6	2	C	L
2743	9		4	D	M
2895	9	6	5	E	N
>2895	>9	6	6	F	P
1295	4	3	8		
≤1219	≤4		9		

THE ISO CONTAINER
ISO 6346: 1995 – TYPE (Gx)

22G0

First character = length
Second character =width and height
Third and fourth character = type

General purpose container

G0	Opening(s) at one end or both ends
G1	Passive vents at upper part of cargo space
G2	Opening(s) one or both ends plus full opening(s) on one or both sides
G3	Opening(s) one or both ends plus partial opening(s) on one or both sides

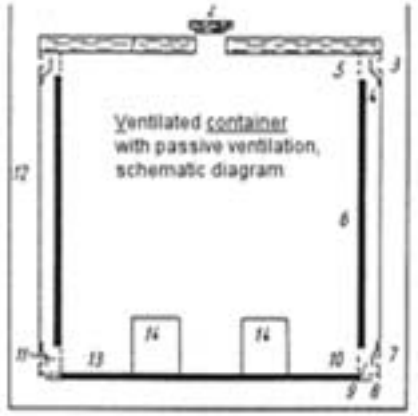
THE ISO CONTAINER
ISO 6346: 1995 – TYPE (Vx)

22V0

First character = length
Second character =width and height
Third and fourth character = type

General container with ventilation

V0	Non-mechanical system, vents at lower and upper part
V2	Mechanical ventilation system, located internally
V4	Mechanical ventilation system, located externally



THE ISO CONTAINER
ISO 6346: 1995 – TYPE (Bx)

22B0

First character = length
Second character =width and height
Third and fourth character = type

Dry bulk container

B0	Nonpresurized, box type, closed
B1	Nonpresurized, box type, airtight
B3	Pressurized, horizontal discharge, test pressure 150kPa1
B4	Pressurized, horizontal discharge, test pressure 265kPa
B5	Pressurized, tipping discharge, test pressure 150 kPa
B6	Pressurized, tipping discharge, test pressure 265kPa

THE ISO CONTAINER
ISO 6346: 1995 – TYPE (Sx)

22S0

First character = length
Second character =width and height
Third and fourth character = type

Named cargo container

S0	Livestock carrier
S1	Automobile carrier
S2	Live fish carrier

THE ISO CONTAINER
ISO 6346: 1995 – TYPE (Rx & Hx)

22R0

First character = length
Second character =width and height
Third and fourth character = type

Thermal container

RO	Refrigerated, mechanically refrigerated
RT	Refrigerated and heated, mechanically refrigerated and heated
R2	Self-powered refrigerated/heated, mechanically refrigerated
R3	Mechanically refrigerated and heated

Thermal container

HO	Refrigerated and/or heated, with removable equipment located externally; heat transfer coefficient K=0,4W/(m2*K)
H1	Refrigerated and/or heated with removable equipment located internally
H2	Refrigerated and/or heated with removable equipment located externally; heat transfer coefficient K =0,7W/(m2*K)
H5	Insulated; heat transfer coefficient K= 0,4W/(m2*K)
H6	Insulated; heat transfer coefficient K= 0,7W/(m2*K)

THE ISO CONTAINER
ISO 6346: 1995 – TYPE (Ux)

22U0

First character = length
Second character =width and height
Third and fourth character = type

Open-top container

U0	Opening(s) at one or both ends
U1	Opening(s) at one or both ends, removable top member(s) in end frame(s)
U2	Opening(s) at one or both ends, plus opening(s) on one or both sides
U3	Opening(s) at one or both ends, plus opening(s) on one or both sides plus removable top member(s) in end frame(s)
U4	Opening(s) at one or both ends, plus partial opening on one side and full opening on the other side
U5	Complete, fixed side and end walls (no doors)




THE ISO CONTAINER
ISO 6346: 1995 – TYPE (Px)

22P0

First character = length
Second character =width and height
Third and fourth character = type

Platform (container)

P0	Platform (container)
P1	Fixed, two complete and fixed ends
P2	Fixed, fixed posts, either free-standing or with removable top member
P3	Folding (collapsible), folding complete end structure
P4	Folding (collapsible), Folding posts, either free-standing or with removable top member

THE ISO CONTAINER
ISO 6346: 1995 – TYPE (Tx)

22T0

First character = length
Second character =width and height
Third and fourth character = type

Tank container

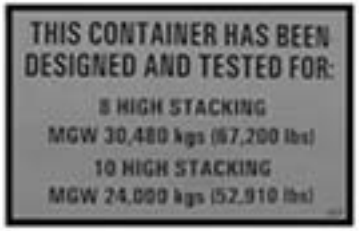
T0	For non dangerous liquids, minimum pressure 45kPa T0
T1	For non dangerous liquids, minimum pressure 150kPa Tl
T2	For non dangerous liquids, minimum pressure 265kPa T2
T3	For dangerous liquids, minimum pressure 150kPa T3
T4	For dangerous liquids, minimum pressure 265kPa T4
T5	For dangerous liquids, minimum pressure 40kPa T5
T6	For dangerous liquids, minimum pressure 60kPa T6
T7	For gases, minimum pressure 910kPa T7
T8	For gases, minimum pressure 220 kPa T8
T9	For gases, minimum pressure (to be decided) T9

THE ISO CONTAINER
OTHER ISO AGREEMENTS

- ISO 8323:1985 - Air/surface (intermodal) general purpose containers - Specification and tests
- ISO 9669:1990 - Interface connections for tank containers
  - Amd 1:1992 - Sections 3 and 4
- ISO 9711 - Information related to containers on board vessels
  - Part 1 Bay Plan System
  - Part 2 Telex data transmission
- ISO 9897:1997 - Container equipment data exchange (CEDEX)
  - Cor 1:2001
- ISO 10368:2006 - Remote condition monitoring
- ISO 10374:1991 - Freight automatic identification
  - Amd 1:1995
- ISO 17363:2007 - Supply chain applications of RFID
- ISO 18185-1:2007 - Electronic seals
  - Part 1: Communication protocol
  - Part 2: Application requirements
  - Part 3: Environmental characteristics
  - Part 4: Data Protection
  - Part 5: Physical layer

THE ISO CONTAINER
IMO - CSC 1977

- 1972 Convention for Safe Containers (into force 1977) has two goals.
  - Safety in container transport & handling - test procedures & strength requirements.
  - Facilitate international container transport - uniform international safety regulations.
- Annex I
  - Regulations for container testing, inspection, approval and maintenance.
  - Approval authorized body (safety approval plate)
- Annex II
  - Structural safety requirements and tests – for inland and maritime transport
  - subsequent maintenance of a safety-approved container responsibility of owner
- 1983 amendments (into force in 1984)
  - Extended interval between re-examination to 30 months (allow periodic examination)
- 1991 amendments (into force in 1993)
  - Included addition new Chapter concerning approval of modified containers.
- 1993 amendments (requires ratification)
  - Concern information on approval plate and amends some test loads and procedures



THE ISO CONTAINER STACKING & MAINTENANCE

- Standard container
  - Max gross weight of about 30 metric tonnes
  - Corner posts designed for 190 metric tonnes load under G force of 1.8
  - Bottom container can support 6 containers
  - Stack height of 7 fully loaded containers
- Container structural inspections
  - Once container is 5 years old
  - Every 3 years after
- IMO report on inspections performed between 1996 and 2002
  - 19,704 containers inspected
  - 1,737 (approximately 9%) had structural deficiencies.