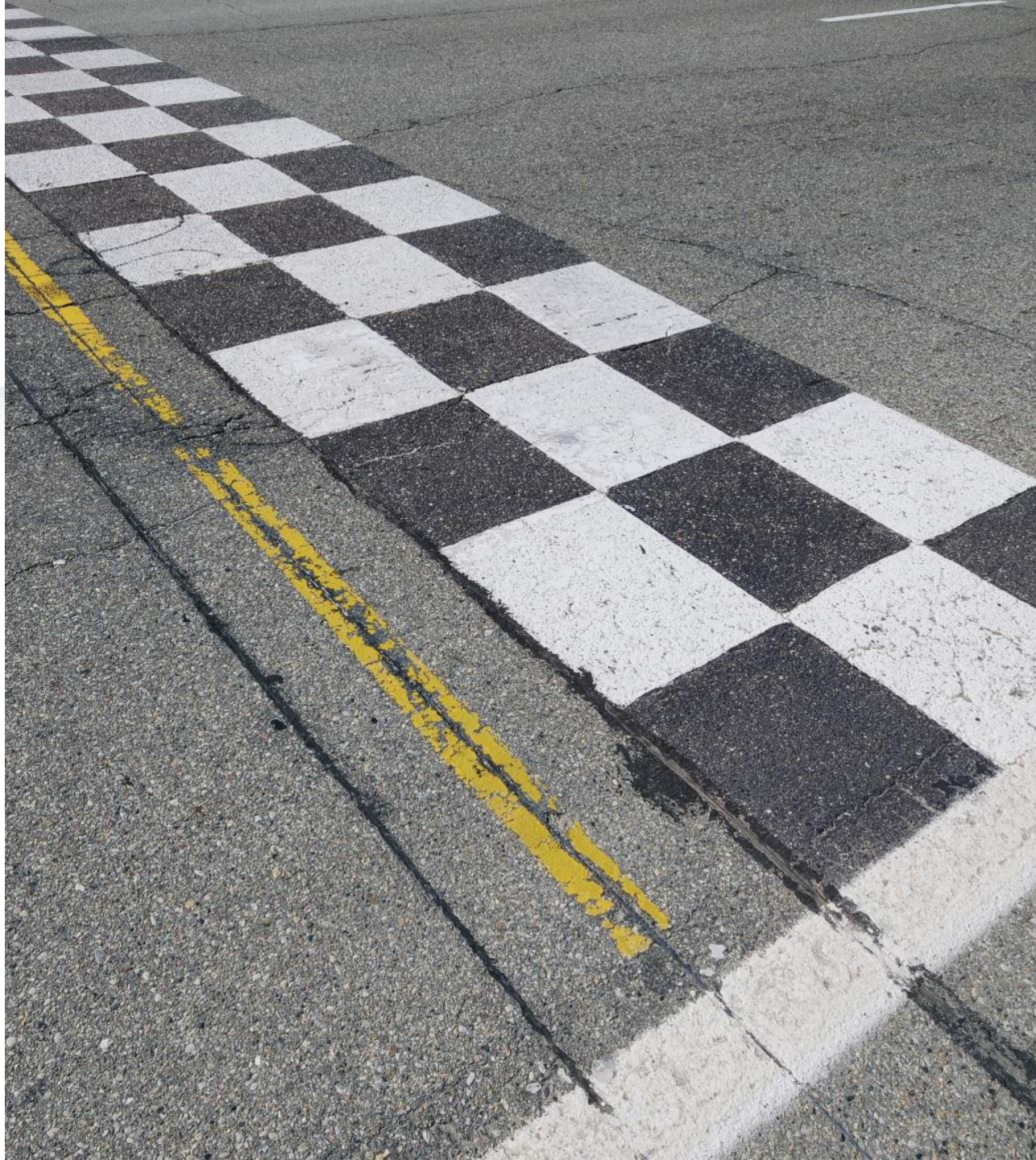
Introduction to design options and constraints

Mike Downes – BIC

including a presentation by Jinping HU - CIMC

Agenda

- Introduction
- Coatings
- Pest hotspots - options
- Modifications currently trialing – CIMC
- Wrap up



Setting the scene

Current design highly optimised in terms of:

Mass

Strength

Ease of manufacture and repair

Compliance e.g. Customs

Cost

Asset life

Design improvements are necessary to solve the pest issue

Changes will mean that COMPROMISE is required

Overall Constraints

Must comply with relevant ISO standards e.g.

- **ISO 1496-1**: Series 1 freight containers - Specification and testing
- **ISO 668**: Series 1 Freight Containers - Classification, dimensions and ratings
- **ISO 3874 :** Freight Containers, Handling and Securing
- **ISO 1161**: Series 1 Freight Containers - Corner Fittings – Specification

any relevant other standards....

CSC - International Convention for Safe Containers

Customs Convention on Containers and T.I.R.

U.I.C. – International Union of Railways

T.C.T. – Timber Component Treatment and FSC

any relevant other requirements...

Coatings (Paint)

Coatings additives will solve the problem

Quick Win?

Sadly NO

- why not?

Coatings - Considerations

Global list of Pests

Longevity of Insecticide additives

Licensing and Approvals

Coatings - Challenges

- Bright colours attract insects
- Additives are non-specific - affect all life forms
- Additives should be environmentally friendly
- Ongoing M&R
- Interior “Upgrades”

Coatings solutions – what can we do for now?

Encourage use of darker shades for exterior colours, except…

Encourage use of light colours for base structure underside

Cease use of bitumastic coatings for understructure

Pest hotspots

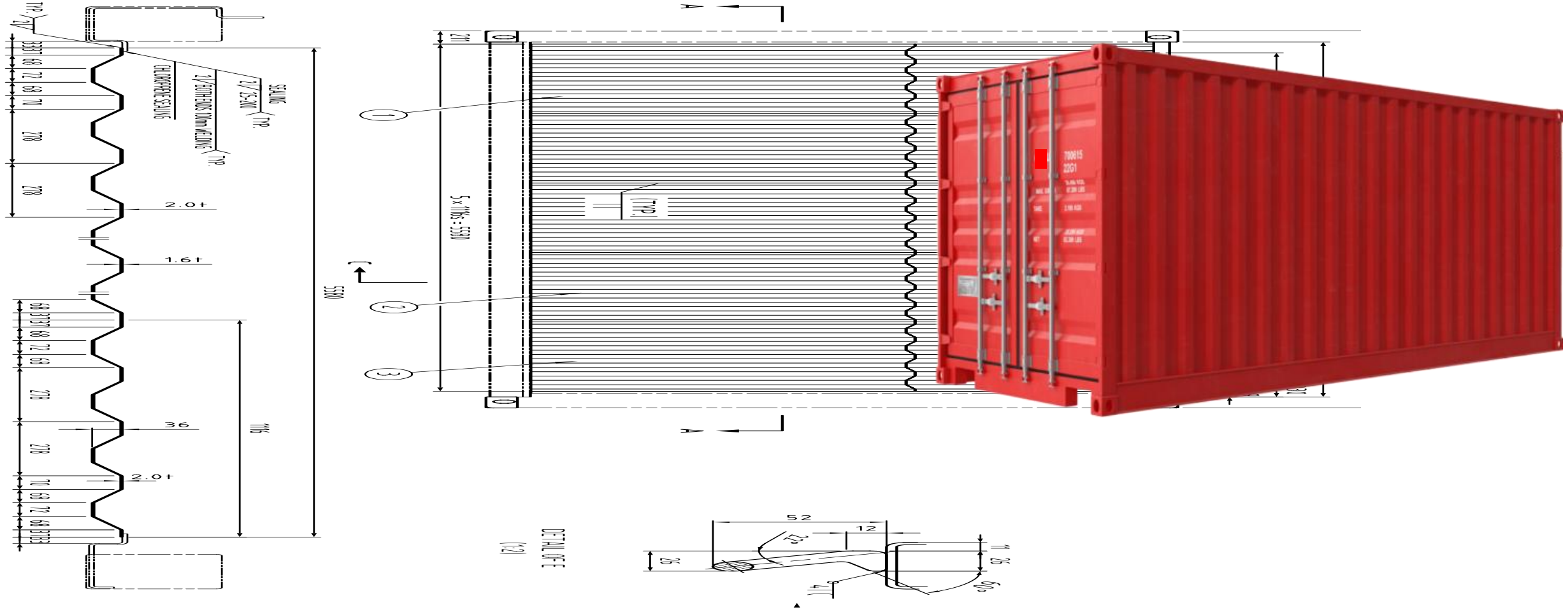
- options

- Side Wall connection to Bottom Side Rail
- Front Wall connection to Front Sill
- Floors
- Door Gaskets
- Vents
- Understructure
  - Cross-members, Bolster, Sills, Bottom Side Rails
- Forklift pockets and Corner Fittings

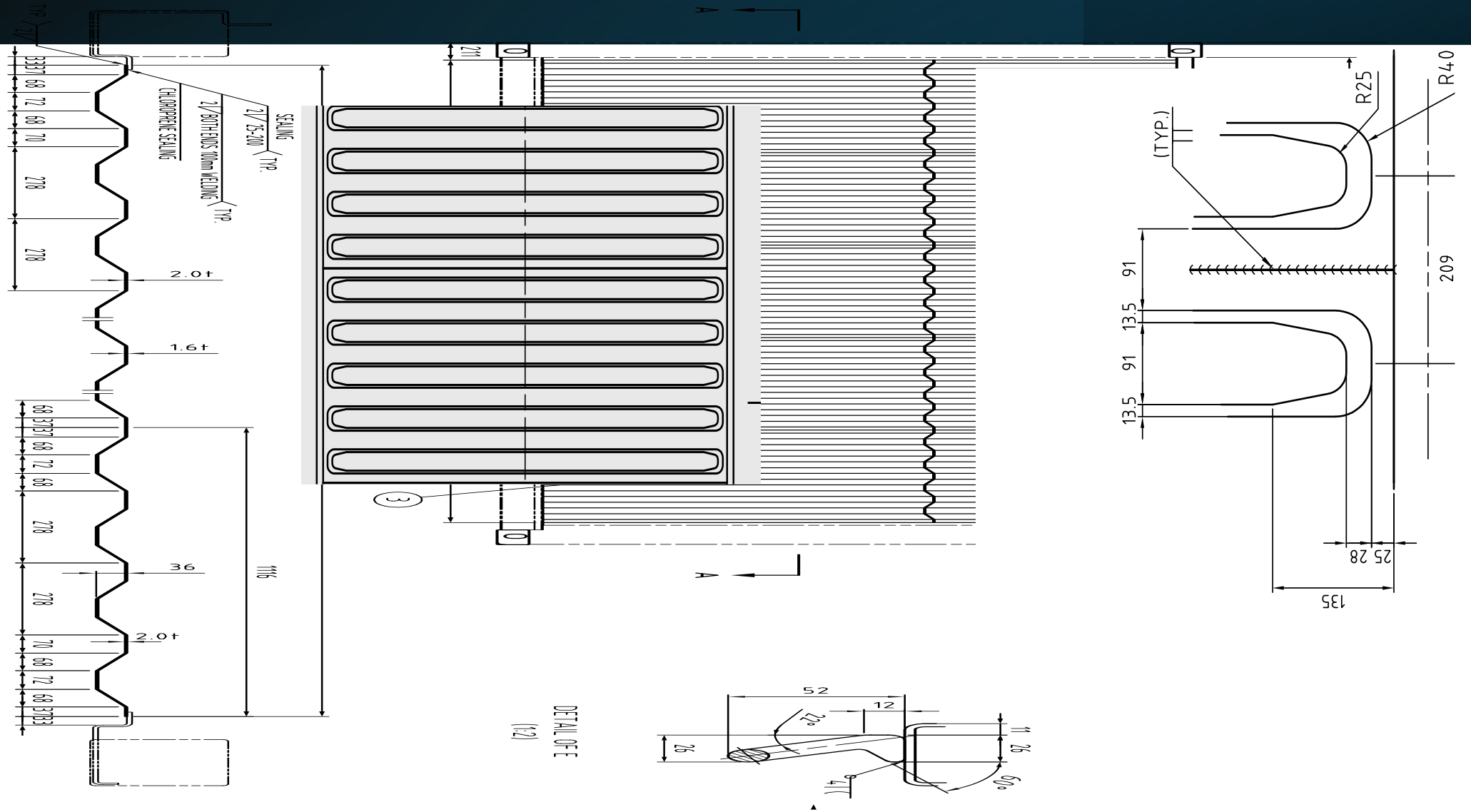
Side and Front Walls

- Side wall profile
- Side wall connection to BSR
- Front wall connection to Front Sill

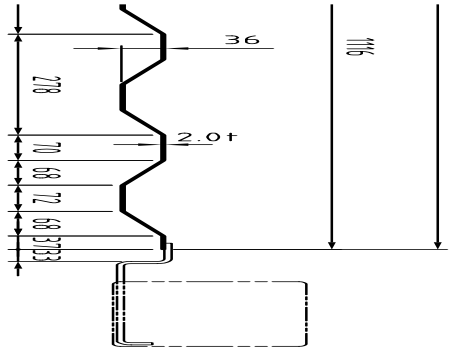
Side Wall profile

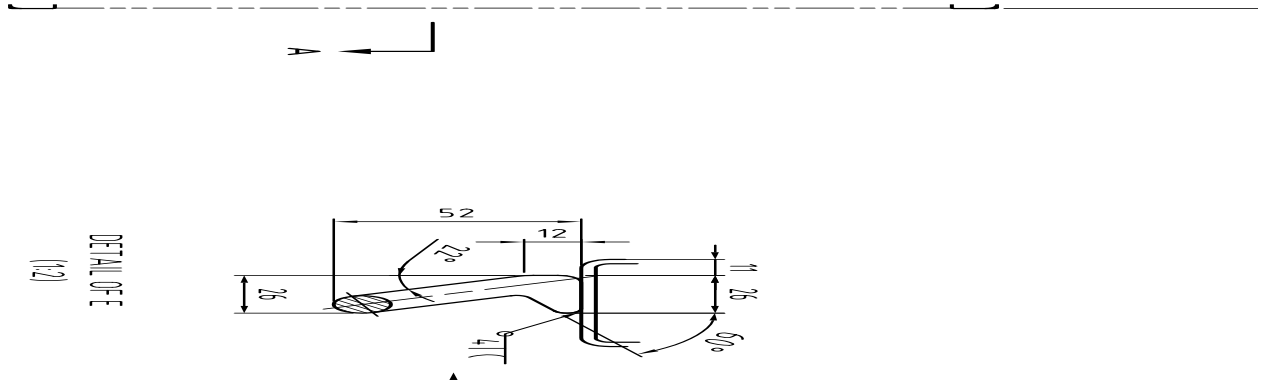


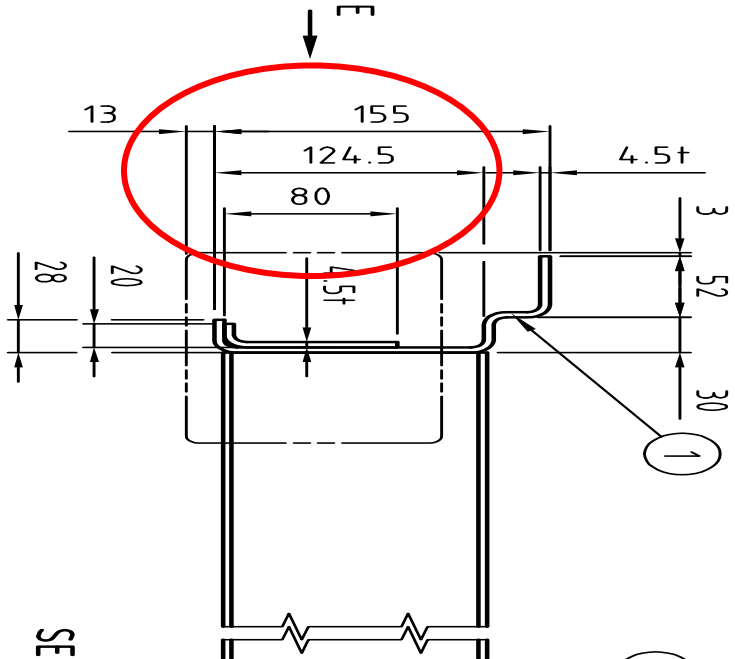
Side Walls – corrugation profile change?

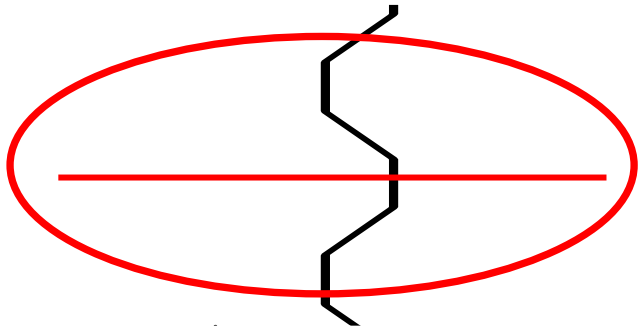


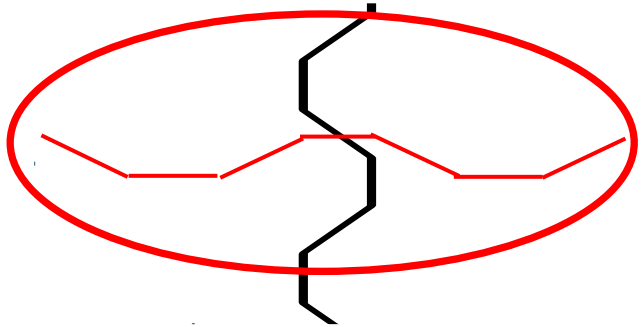
Side Wall connection – scalloped BSR top flange?



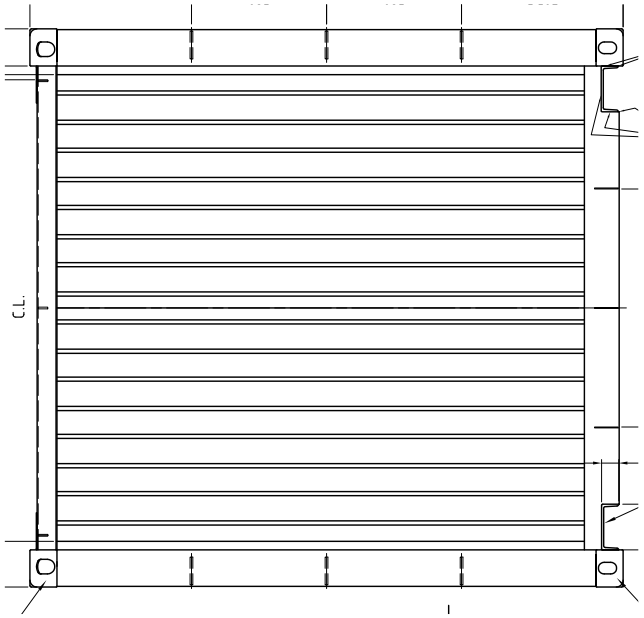


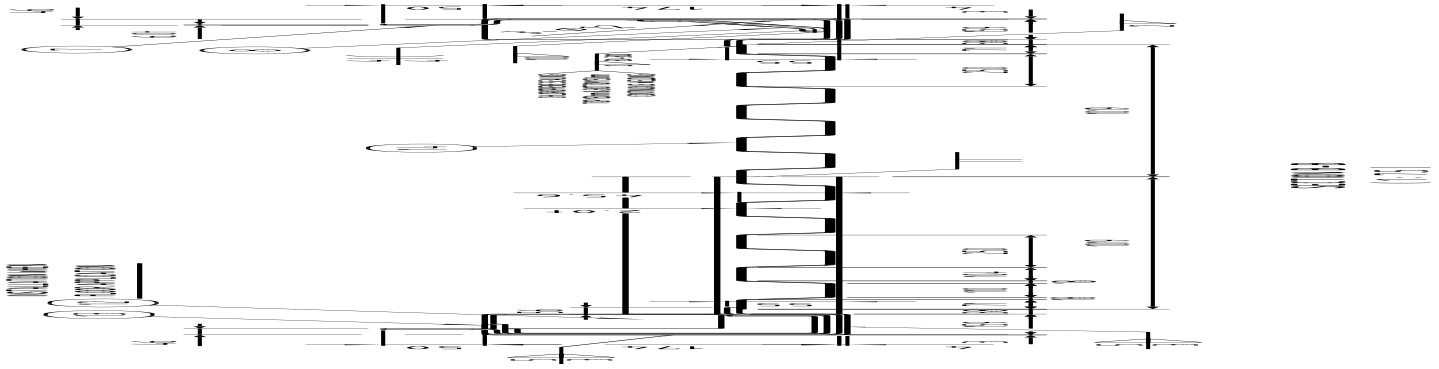






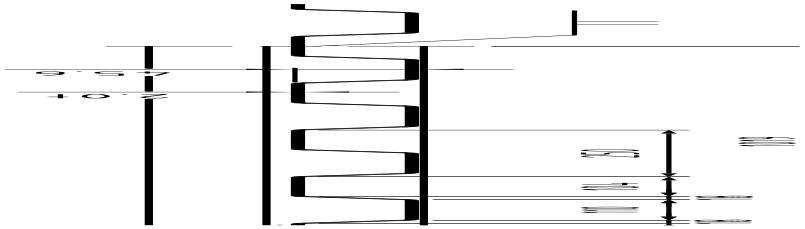
Front Wall

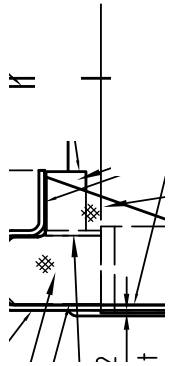




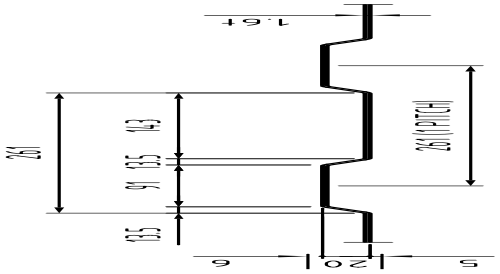
Front Wall - profile change?
- scalloped insert?

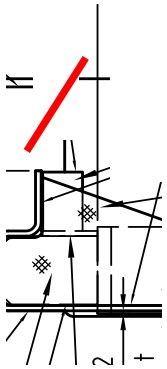
Current corrugation profile



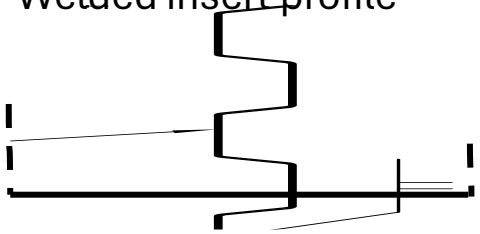


Roof corrugation profile





Welded insert profile

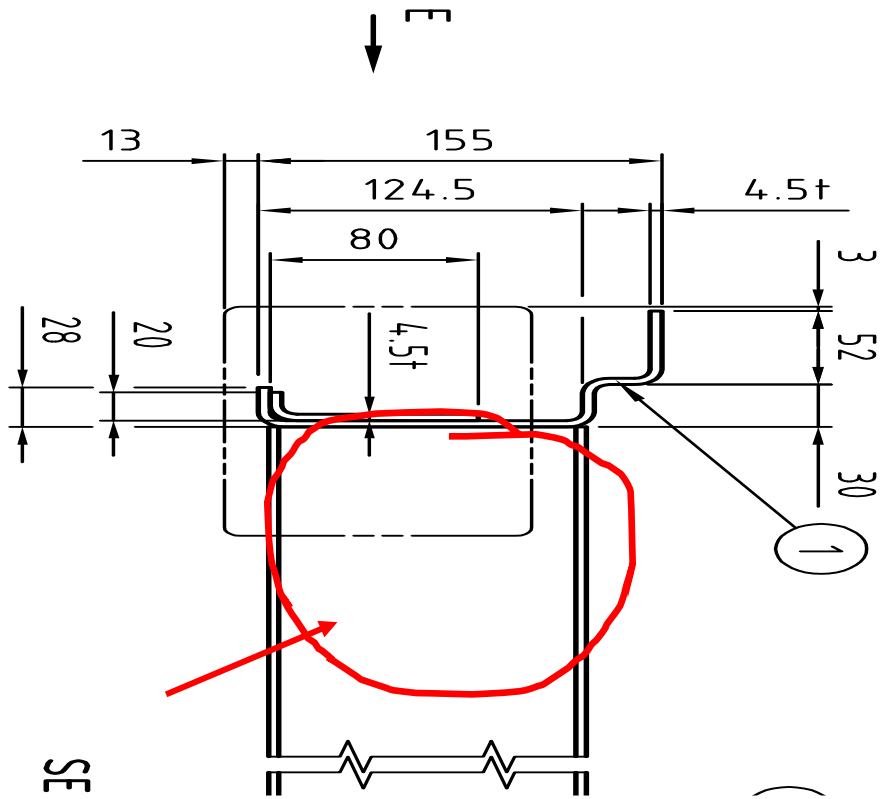


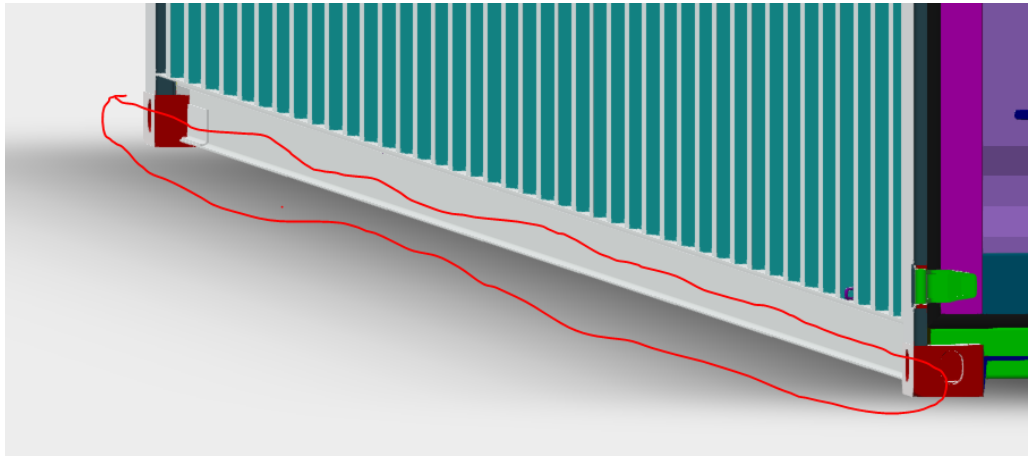
Roof style corrugation profile will not have sufficient strength

Understructure

- Bottom side rail
- Bolster
- Cross-members
- Front & Rear sills and Fork-lift pocket

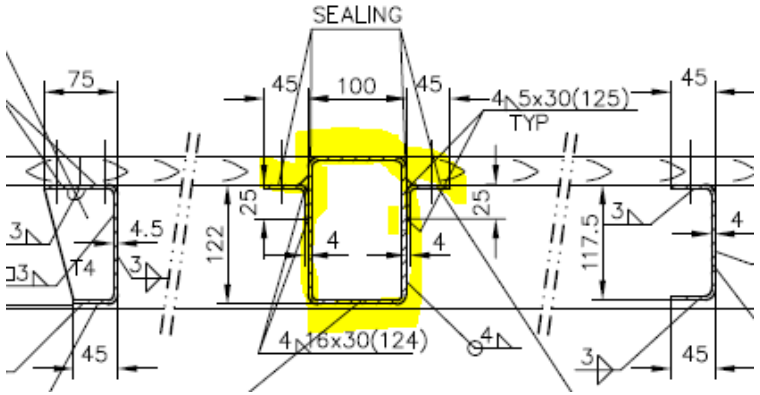
Bottom Side Rail - lower flange reduction?



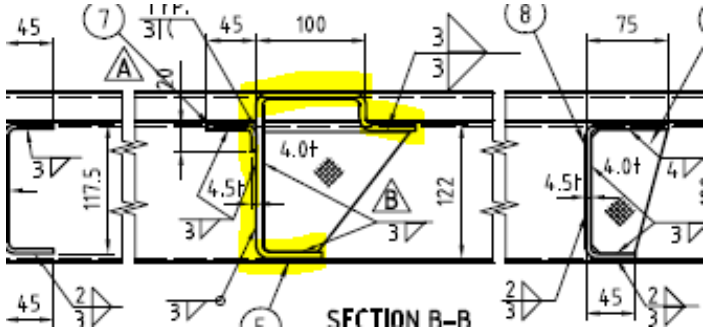


Bottom Side Rail lower flange dimension potential for reduction – currently 20 mm

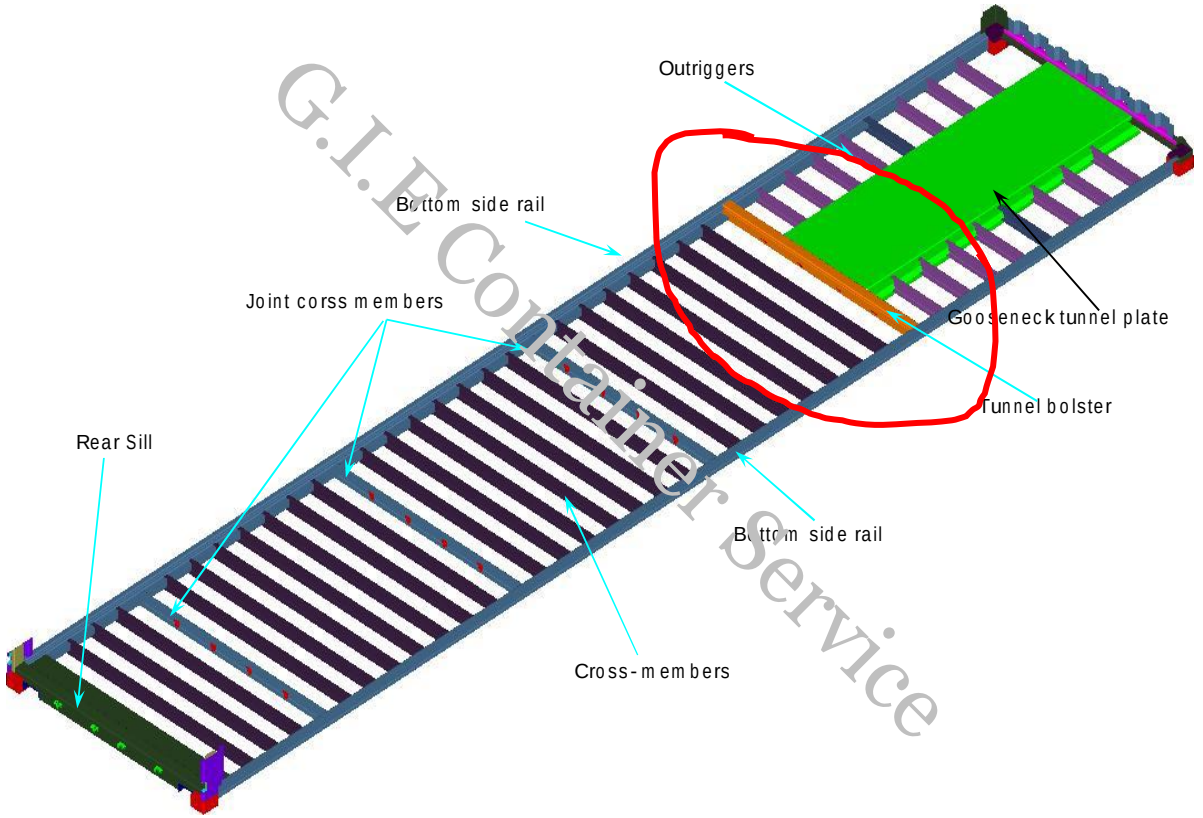
Bolster - common profile?



Closed profile Bolster

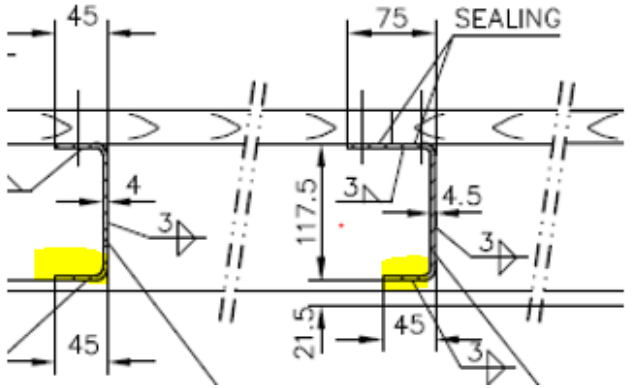


Open profile Bolster

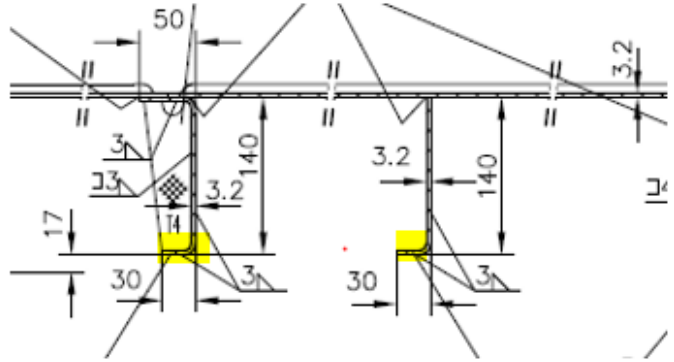


Both Open and Closed profile Bolster designs are in use across the industry – align specifications to <u>Closed only</u>

Cross-members - potential to reduce number ?
- lower flange dimension reduction



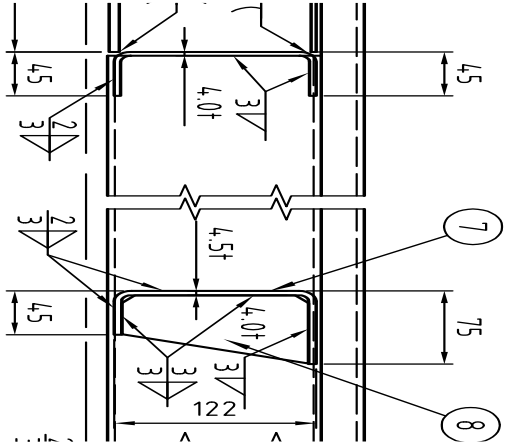
Standard lower flange 45 mm

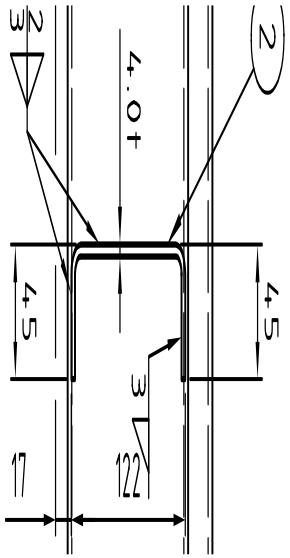


Steel floor lower flange 30 mm

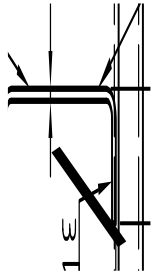
Reduce the total number of cross-members
or
Reduce cross-member (and rear-sill) lower flange dimensions

Cross-members - profile change?
- corrugated base?

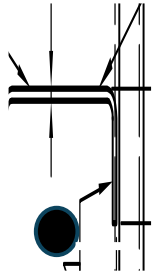




Closed



Bulb

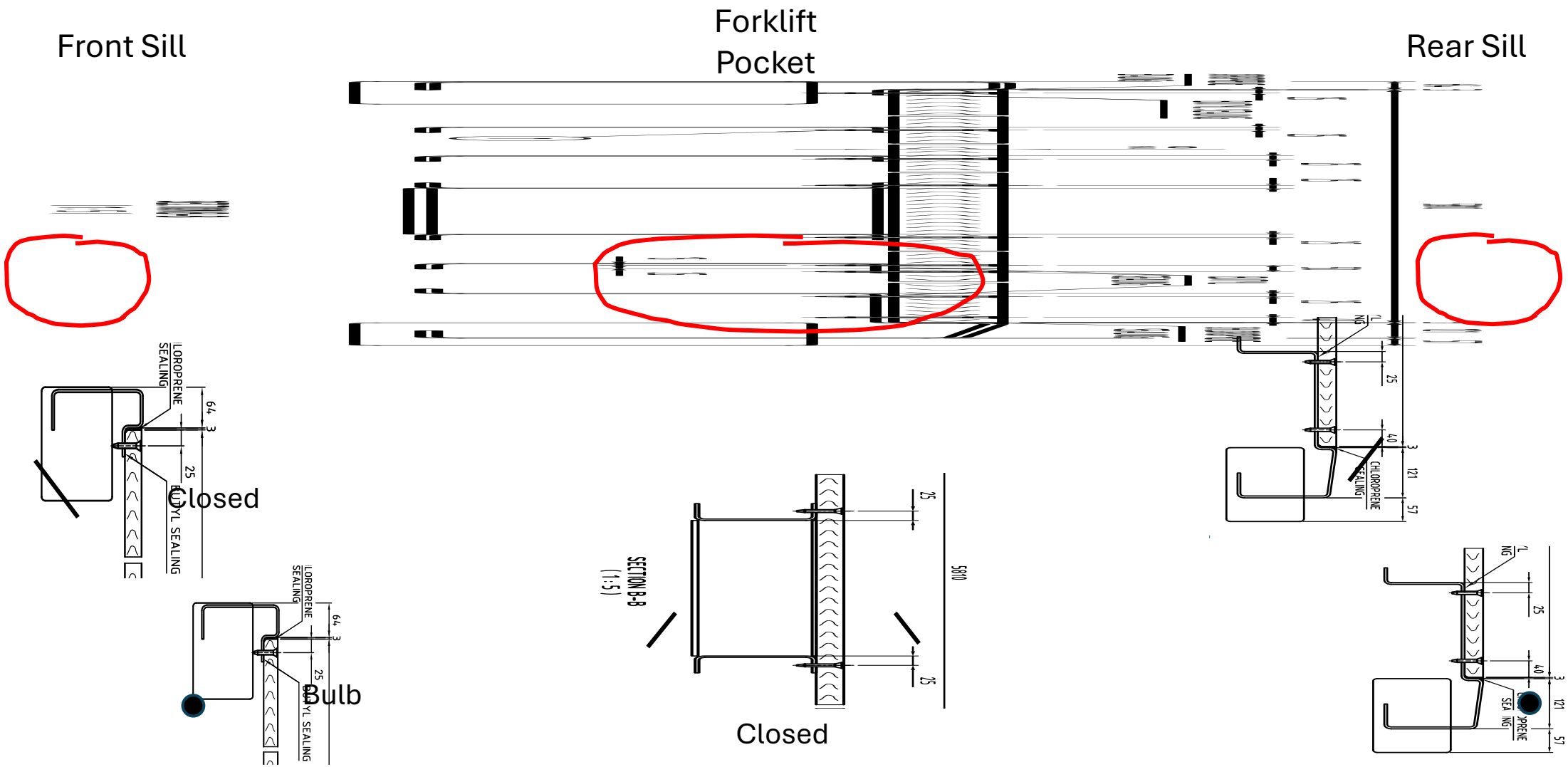


Beam

Corrugated Base

Front and Rear Sills & Forklift Pocket

- lower flange dimension reduction?
- revised profiles?

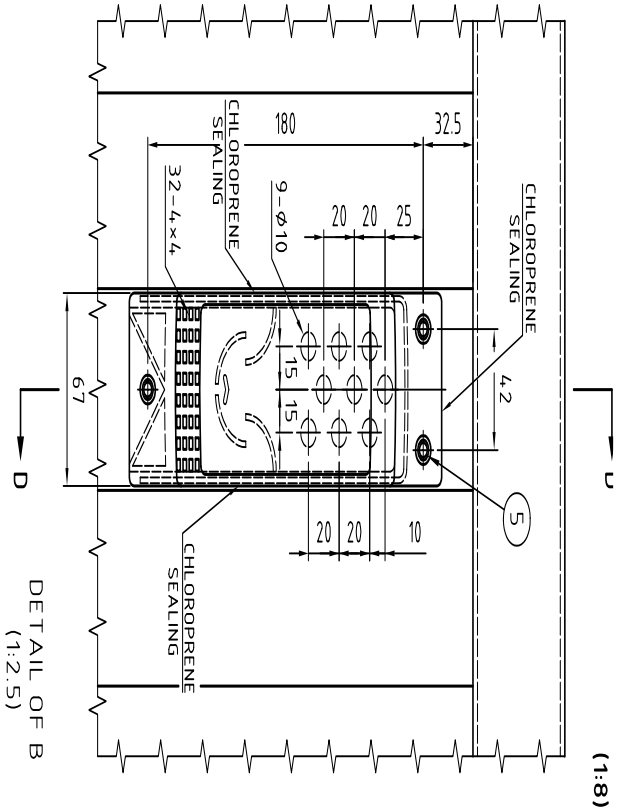


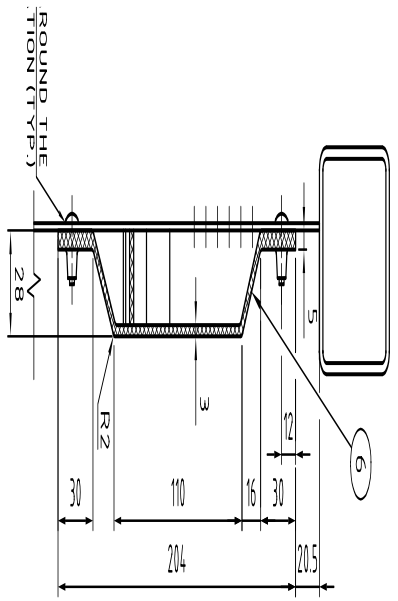
Others

- Vents - number and design
- Door Gaskets
- Corner Fittings (Castings)

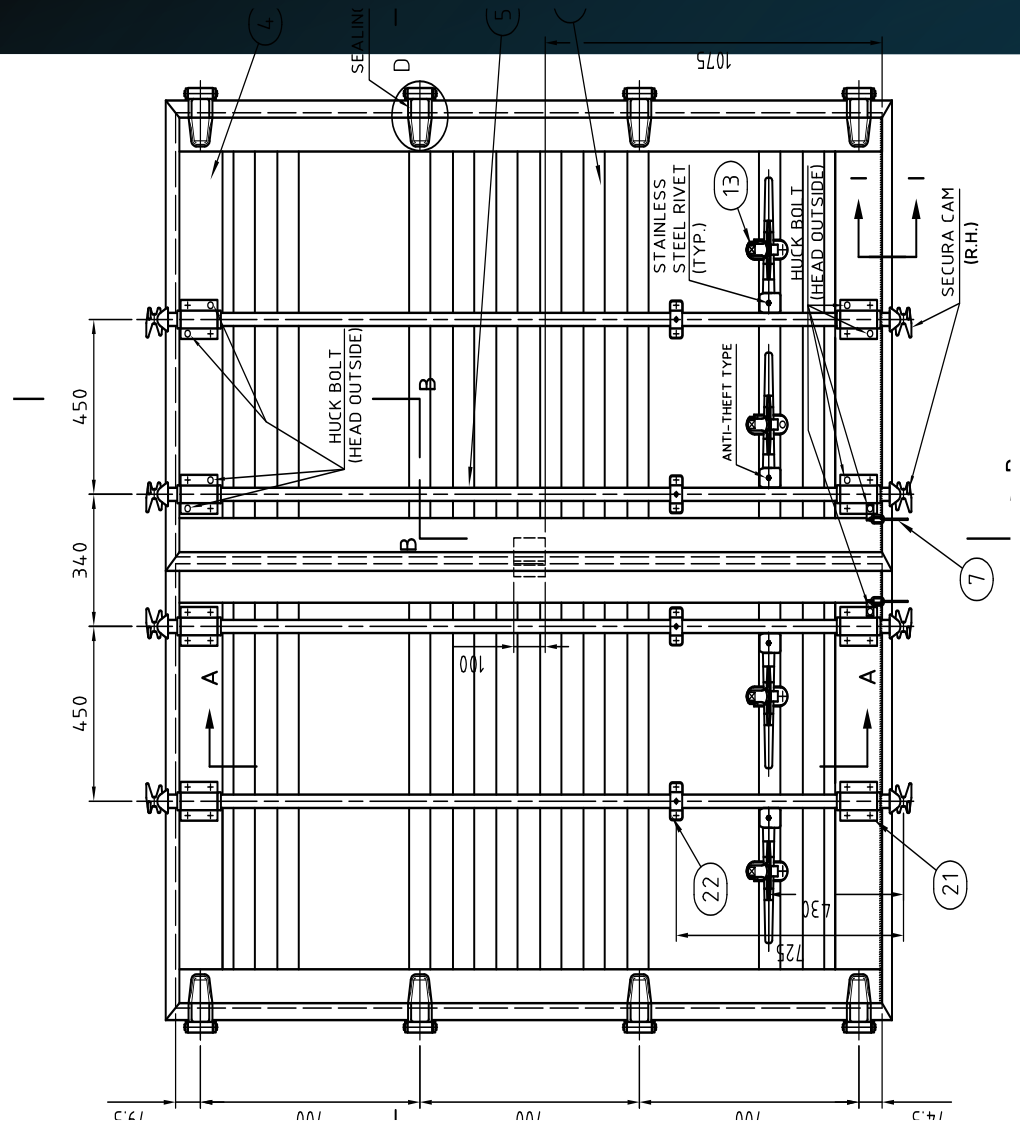
Vents

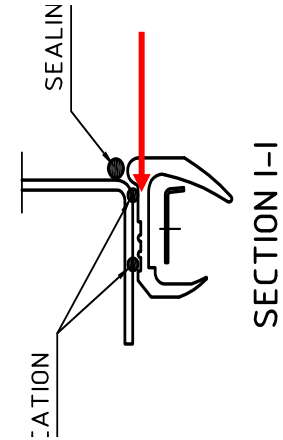
- reduce number of vents to 2 or 0?
- Improve design (insect proof)



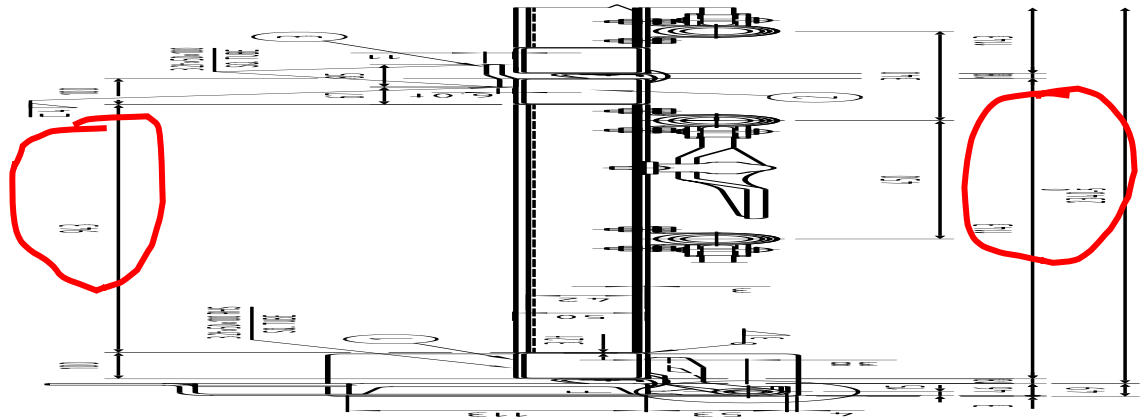


Door Gaskets - redesign? - improved securing?





Door Gasket cross-section



Corner Fittings - operational solutions?

Bottom corner fittings can contain soil, which may not be dislodged by twist-locks. Design change is problematic - the only solution may be enhanced inspection and cleaning

Floor

- Floor Material
- Avoidance of gaps, cracks and crevices
- Steel floors

Floor materials - what is available?

- Tropical Plywood
- Bamboo composites
  - Pine
  - Eucalyptus
  - OSB
  - Hybrid
- Full Bamboo
- Composite
  - Plastic
  - WPC
  - FRP
- Laminated softwood
- Planks
- Phenolic coatings
- Steel

Plywood is insecticide treated (glue line) to prevent infestation

Bamboo, Composite, Steel do not require treatment

The material that the floor is made of is of less importance, in pest contamination terms, than the way that the floor is assembled and secured in the container

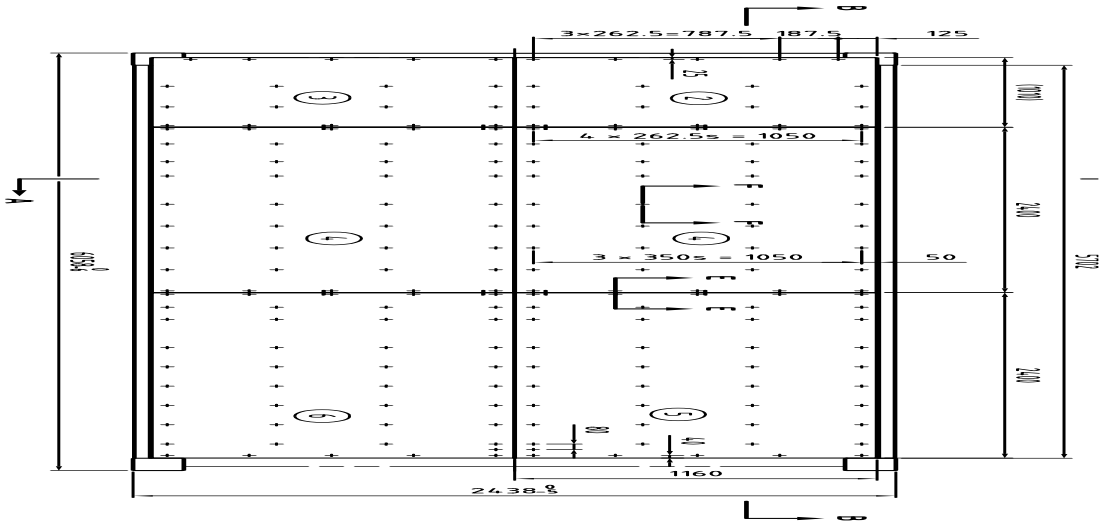
Contamination is more generally related to gaps at ends, sides, joins and underneath floors

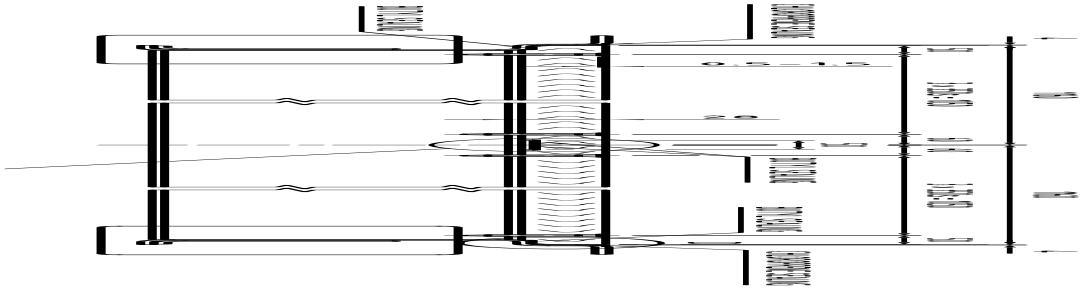
Floors - avoidance of gaps

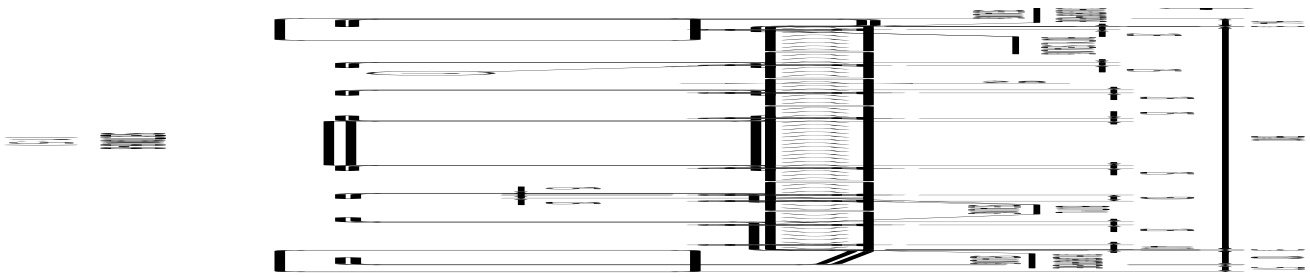
Brand new – a thing of beauty!

Soon turns to this!

Floors - avoidance of gaps

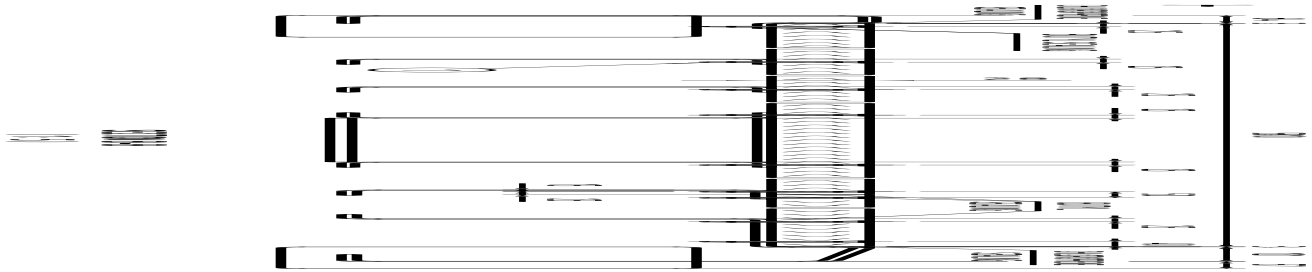






Typical 20ft container wood floor arrangement – all gaps closed with sealant

Floors - avoidance of gaps



Use Omega profiles – ends and sides?

Improved Sealant?

How to deal with damage, separation of floor from cross-members etc.?

Steel Floors - the “no-gap” floor

Steel floors require modifications to base structure. An overall tare weight increase may be involved.

Customer resistance is often given as a reason for non-adoption.

Steel floors are fully welded at ends, sides and joins and offer no opportunity for pest infiltration from inside or outside

There are advantages for repair and cleaning

Modified Container Trials and Design Suggestions

Mr Jinping Hu

Technical Manager

CIMC Containers (Group) Ltd

Container Test

- Organized by China Customs, 6 units of 20’GP ISO containers with **8 New Designs** made by CIMC have been put into the international marine transport test since May 2024.
- The purpose of this test is to verify if these New Designs are feasible and effective to Mitigate Risks of Pest Contamination.
- Voyages for this test are all over the world, and will last for 18 months, and CIMC has joined the surveys regularly.

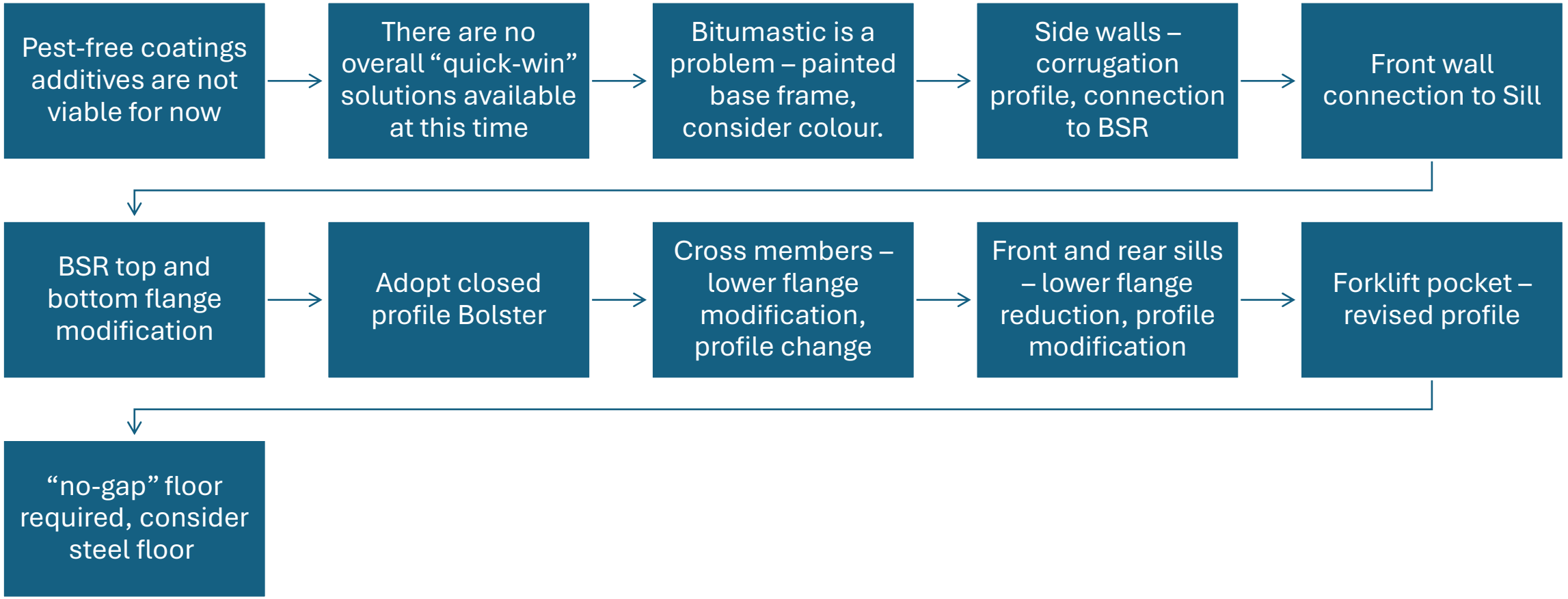
8 New Designs

CIMC CONTAINERS

No.	Item	New Design	Effect
1	**Container Floor**	Apply CFRTP(Continuous Fiber Reinforced Thermo-Plastic) film on top & bottom of floor	Make floor stronger, reduce damages like cracks
2	**Floor connections**	high quality sealant on floor connections	Reduce gaps, crevices
3	**Container Coating**	CFRTP panels instead of steel panels	No need coating, reduce the risk of pests' sticking Much easier to clean, Rust-free, Odor-free
4	**Undercarriage Coating**	Powder Coating/High Solid Coating in light color	Cease the use of bitumastic undercarriage coating
5	**Undercarriage Crossmember**	Closed shape instead of original open style	Quite difficult to collect soil and pests
6	**Undercarriage Bottom Side Rail**	Add cover plates to form a closed section or directly remove the lower flange	minimize collecting soil and pests
7	**Undercarriage Tunnel Bolster**	Closed shape instead of original open style	Reduce collecting of soil and pests on lower flanges of container
8	**Ventilator**	labyrinth design	Make insects and pests difficult or impossible to go through

Wrap up
and
closing remarks

Recap


Pest-free coatings additives are not viable for now
There are no overall “quick-win” solutions available at this time
Bitumastic is a problem – painted base frame, consider colour.
Side walls – corrugation profile, connection to BSR
Front wall connection to Sill
BSR top and bottom flange modification
Adopt closed profile Bolster
Cross members – lower flange modification, profile change
Front and rear sills – lower flange reduction, profile modification
Forklift pocket – revised profile
“no-gap” floor required, consider steel floor

Recommendations for the ideal pest-free container

- Modified BSR/Sidewall connection
- Modified Front Sill/Front Wall connection
- “no gap” Floor (consider steel floor)
- Modified Base structure
- Coatings – light colours, painted base structure (no bitumastic)
- Modified Vent

Thank you for your attention

Questions?

CONTAINER OWNERS ASSOCIATION

World Shipping Council