Fire Prevention on Container Ships & Other Major Risks

The Innovative SEC CMS System

by
G. Karavolos – CEO Seamark

Innovation made in Bremen

H.I.M.T
Annual Conference
Dec 2024

SECURING YOUR VISIONS

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Contents

- Fires on Containerships – The Challenge
  - The Causes – Acts of God and Misdeclared Cargoes
  - Fire-Fighting Rules & Practices
  - Fire Prevention vs Fire Fighting
- Other Damage / Loss Risks
  - Excessive Container Weights
  - Twistlocks Out of Place
- The SEC CMS Solution
  - Concept
  - How it Works - Components
  - Installation & Service
- Application – Timeline
  - Newbuildings & Existing Vessels
  - Return on Investment

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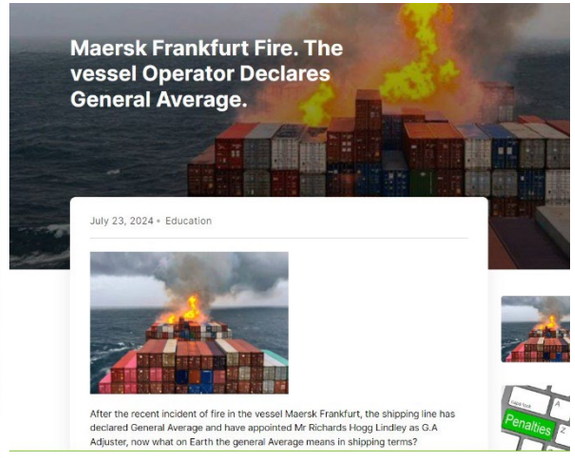
Fires on Containerships - The Challenge



Maersk Frankfurt
July 19, 2024

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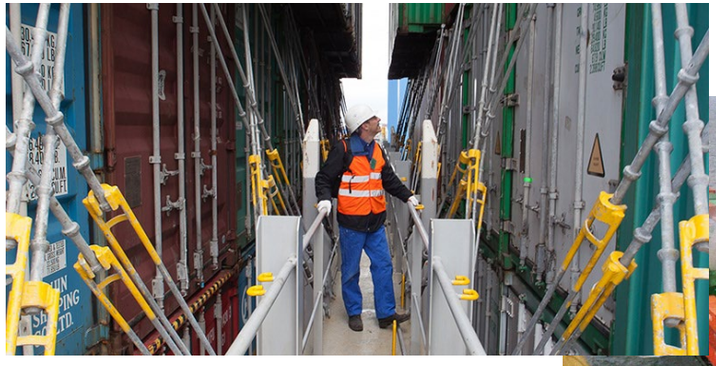
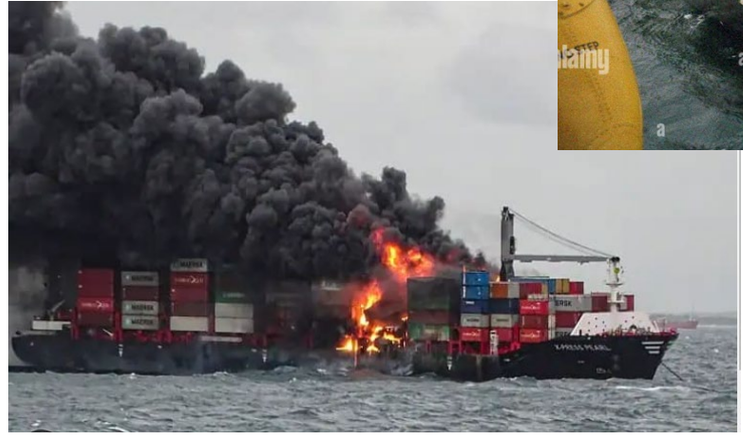
Fires of Containers start from the Contents





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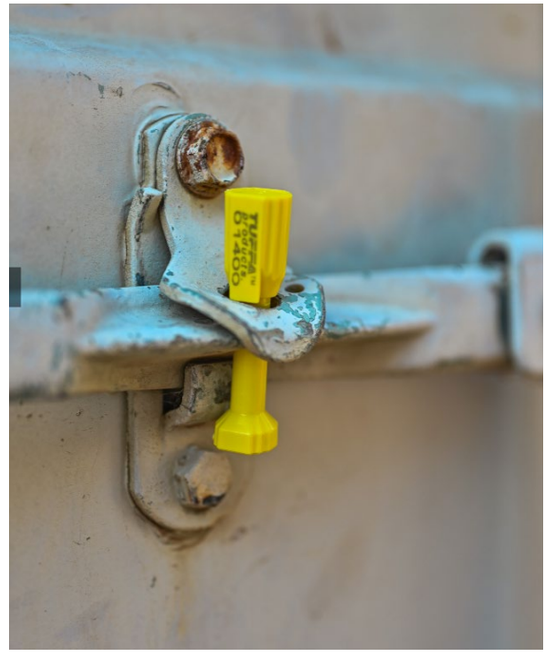
Cause: Act of God, or Misdeclared Cargoes?



- 250mil containers in annual traffic
- Containers cannot be opened for inspection (unless…)
- Contents (& Weight) often Misdeclared
- Misdeclared Contents - Serious Cause of Fire Incidents
- Misdeclared Weight – Serious Cause of Stack Collapse
- Crackdown Efforts Unsuccessful

- Typical Reactive Hazardous Commodities:

  - Charcoal / carbon
  - Calcium Hypochlorite
  - Lithium-ion batteries
  - Cotton and wool
  - Fishmeal and krill
  - Seed cake

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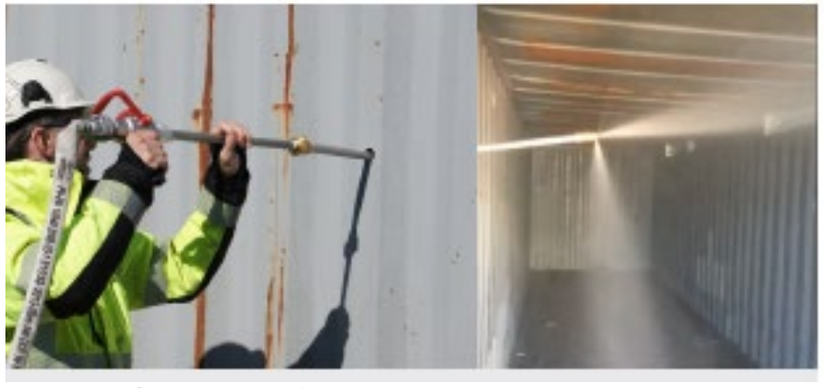
Fire-Fighting Rules & Practices

- Water Monitor & Water Mist Lance Compulsory on Containerships NB since 2016 (acc SOLAS)
- Fire-Fighting Vessels
- Approach to a Nearby Port



Courtesy of Survitex - XFlow

Conclusion:

Fire Prevention is better than Fire Fighting

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Other Major Risks

Courtesy of Container News

- Misdeclared Weights – Stack Overload
- Twistlocks Not In Place

Challenges

- Weight of containers not verified at port
- Loading sequence based on declared weight
- Stack overload - stack collapse over voyage
- Containers out-of-shape or light weight can result in twistlocks not-in-place, non-locked.

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The SEC Innovative CMS Solution

- **Containers Temperature Monitoring / Fire Prevention, *AND :***
- **Containers Weight Measuring**
- **Twistlocks Locking Detection**

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SEC Container Monitoring System (CMS) – The Project

The Project

- Funded by the German Federal Government
- Period 1.7.23 – 30.6.26 (3 Years)
- In Operation ~ 1.5 Years

The Functions – In Port & At Sea

- **Temperature Monitoring - Fire Prevention**
- **Containers Weight Verification**
- **Twistlocks Locking Confirmation**

- Fire Prevention via Real-Time Monitoring Temperature Change on All Containers Aboard
- Self-learning FEM Model
- No Amendments to Port Operation
- Route Recommendations to avoid excessive loads to cargo

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ZIGPOS

Gefördert durch:

Bundesministerium für Wirtschaft und Klimaschutz

aufgrund eines Beschlusses des Deutschen Bundestages

CMA CGM

Fraunhofer IGP

Fluiddynamik und Schiffstheorie

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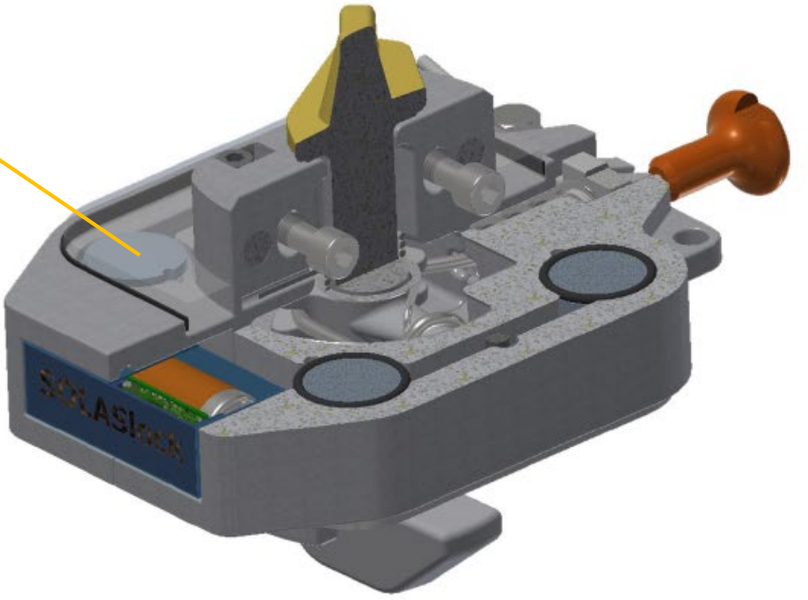
SEC Container Monitoring System (CMS) - The Components

CMS - Bottom Twistlock

Component

- Semi-Automatic Twistlock
- 4 Calibrated Load Cells
- Battery Powered (*)



Function

In Port:

- Measures Weight
- Detects Added Stack Container

At Sea:

- Measures Dynamic Load
- Detects Container Loss

(*) battery replaceable min. every 5 years

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SEC Container Monitoring System (CMS) - The Components

CMS - Intermediate Twistlocks

Component

- HD-FAT Twistlock
- Battery Powered (*)

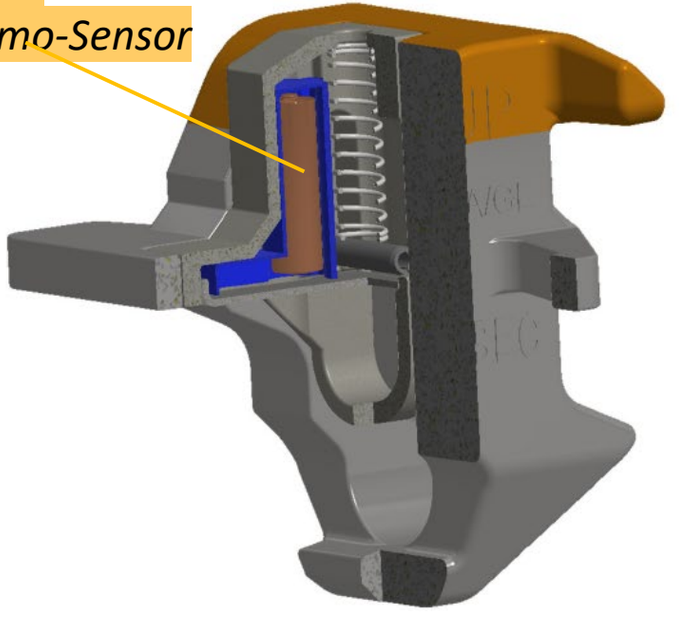
Function

In Port:

- Loading of Container
- Locking Status

At Sea:

- Local Temperature Change



(*) battery replaceable min. every 5 years

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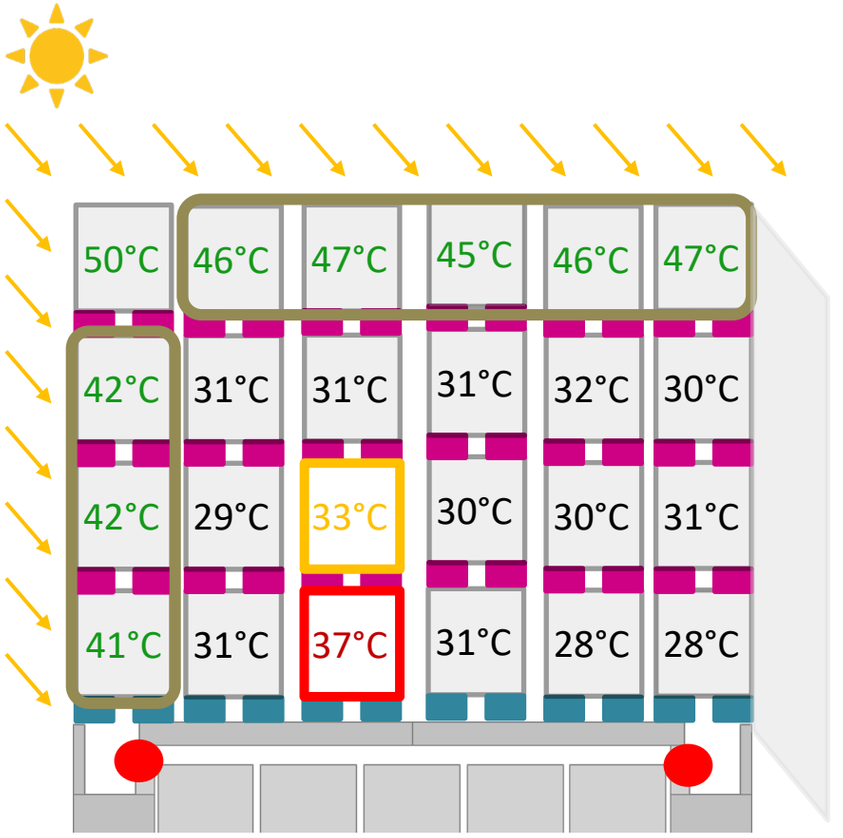
SEC Container Monitoring System (CMS) - Temperature Monitoring

Features

- Individual Container Temperature Monitoring via Twistlock built-in Themo-Sensors
- Evaluates Temperature Changes in relation to:
  - Sun or Shadow,
  - Container Position,
  - Vessel Course &
  - Time, Duration
- Twistlock Sensors indicate also Locking Status



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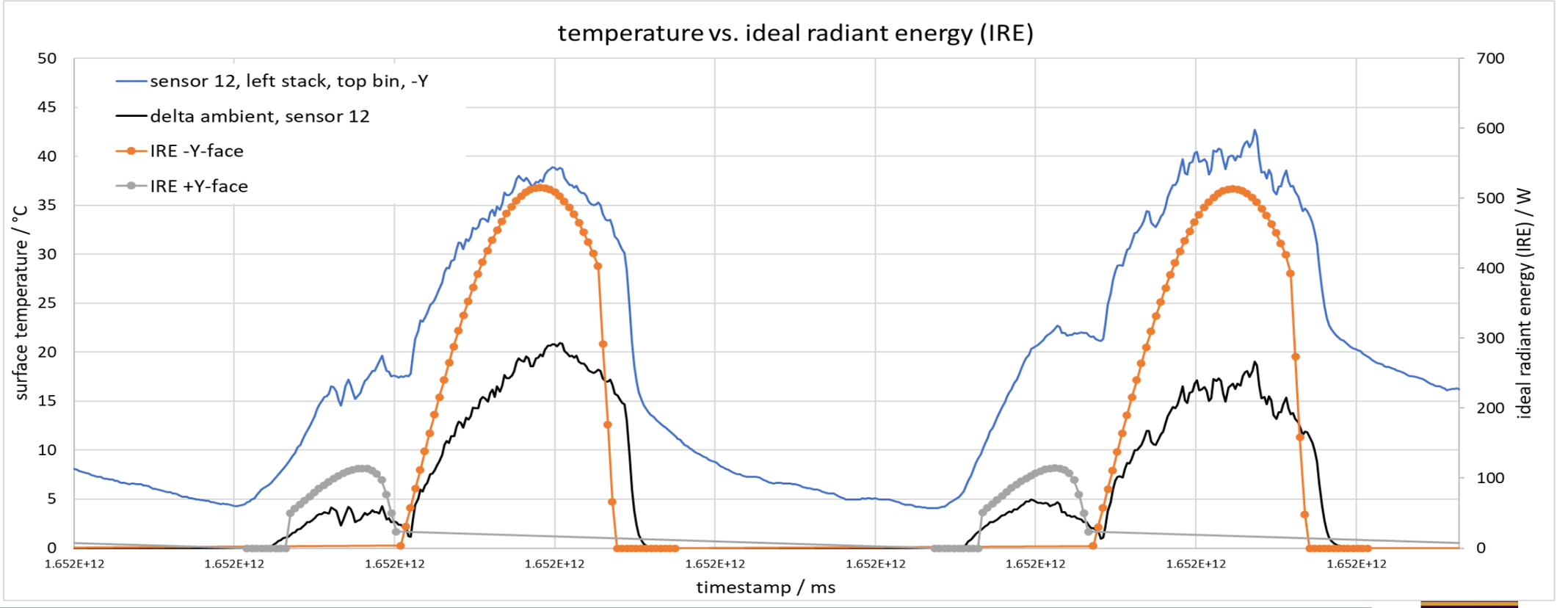
SEC Container Monitoring System (CMS) - Temperature Monitoring

Temperature Relative Change Calculation – *Delta Ambient vs IRE*



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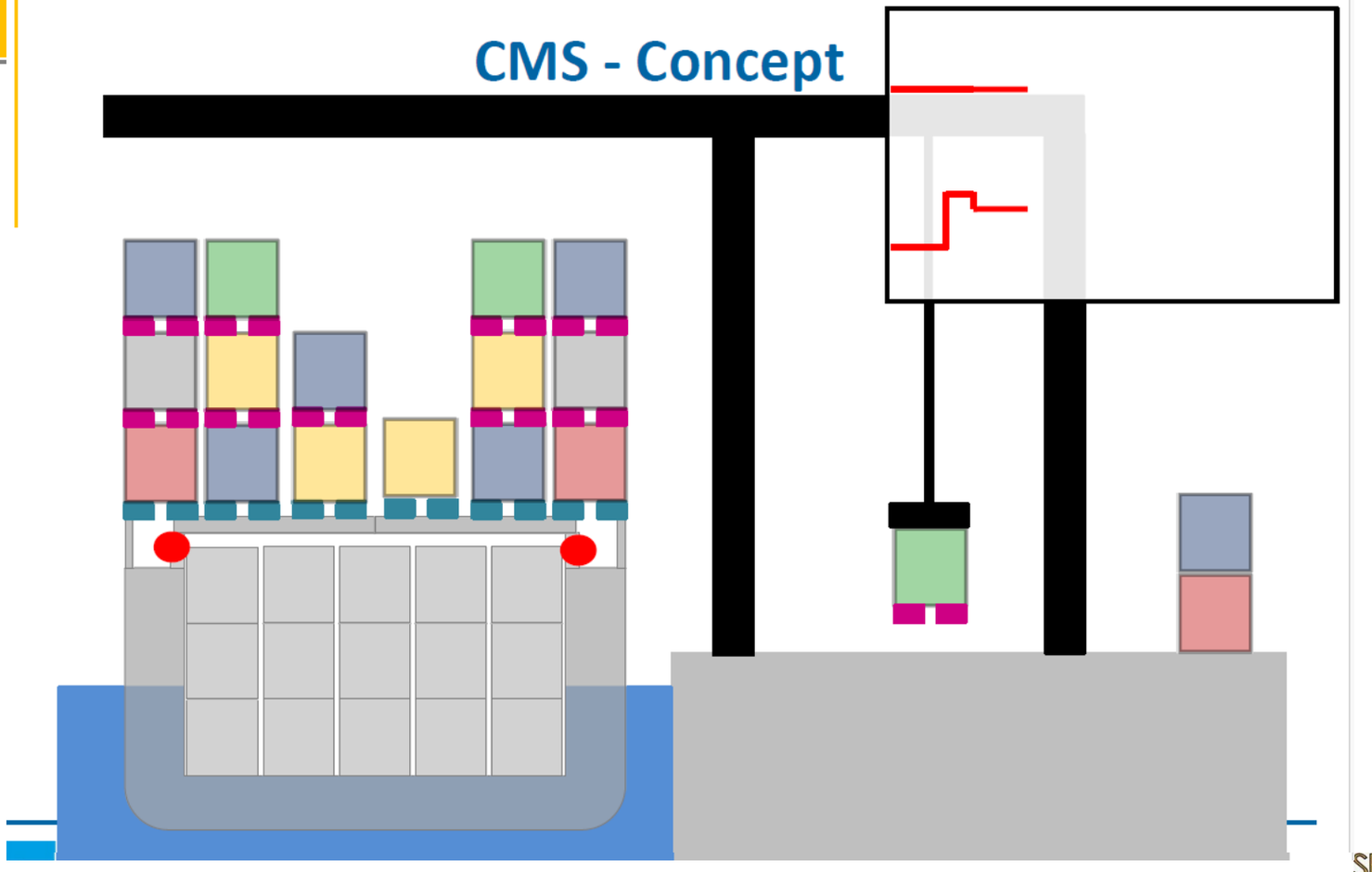
SEC Container Monitoring System (CMS)
- Weight Verification



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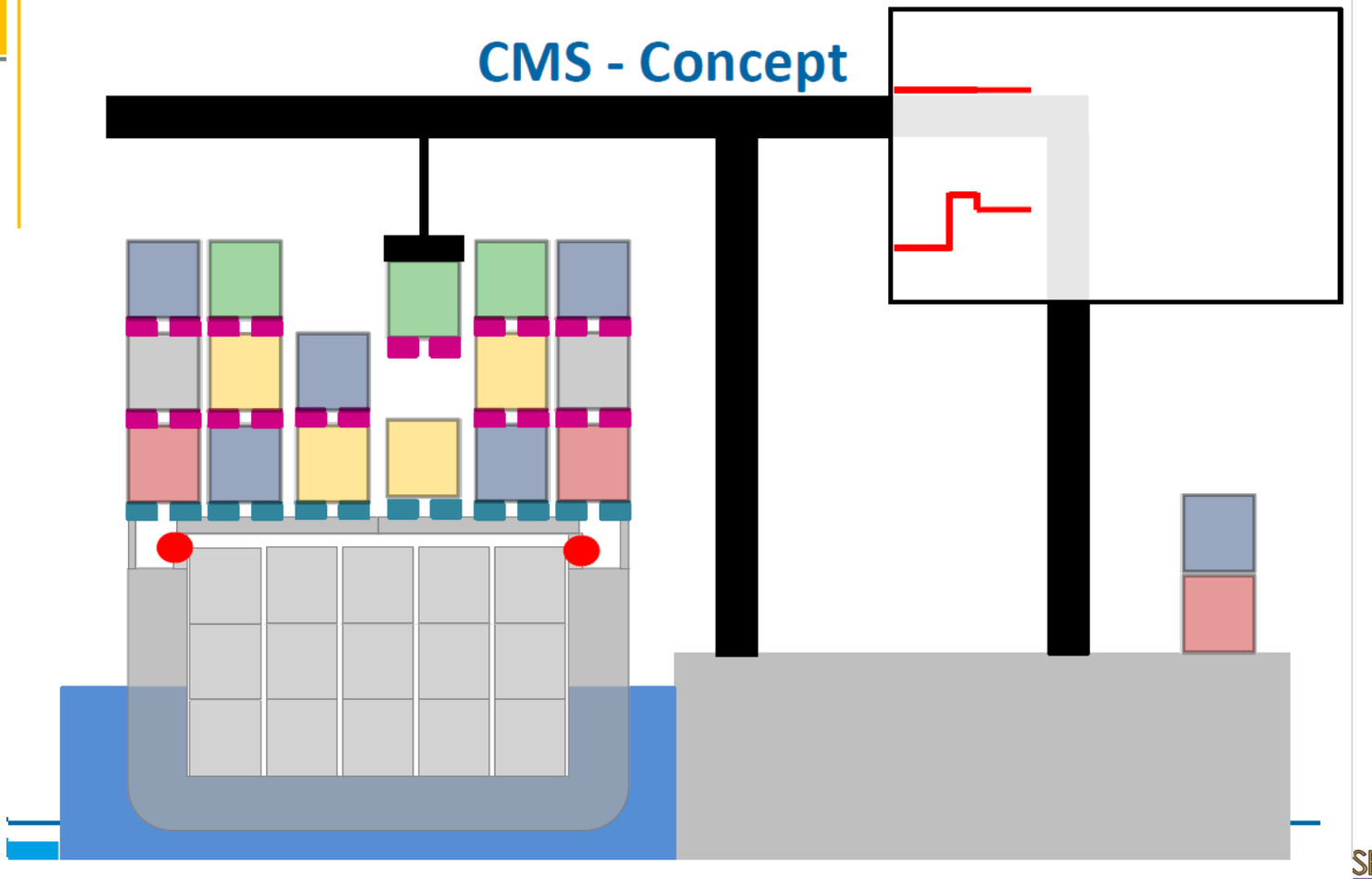

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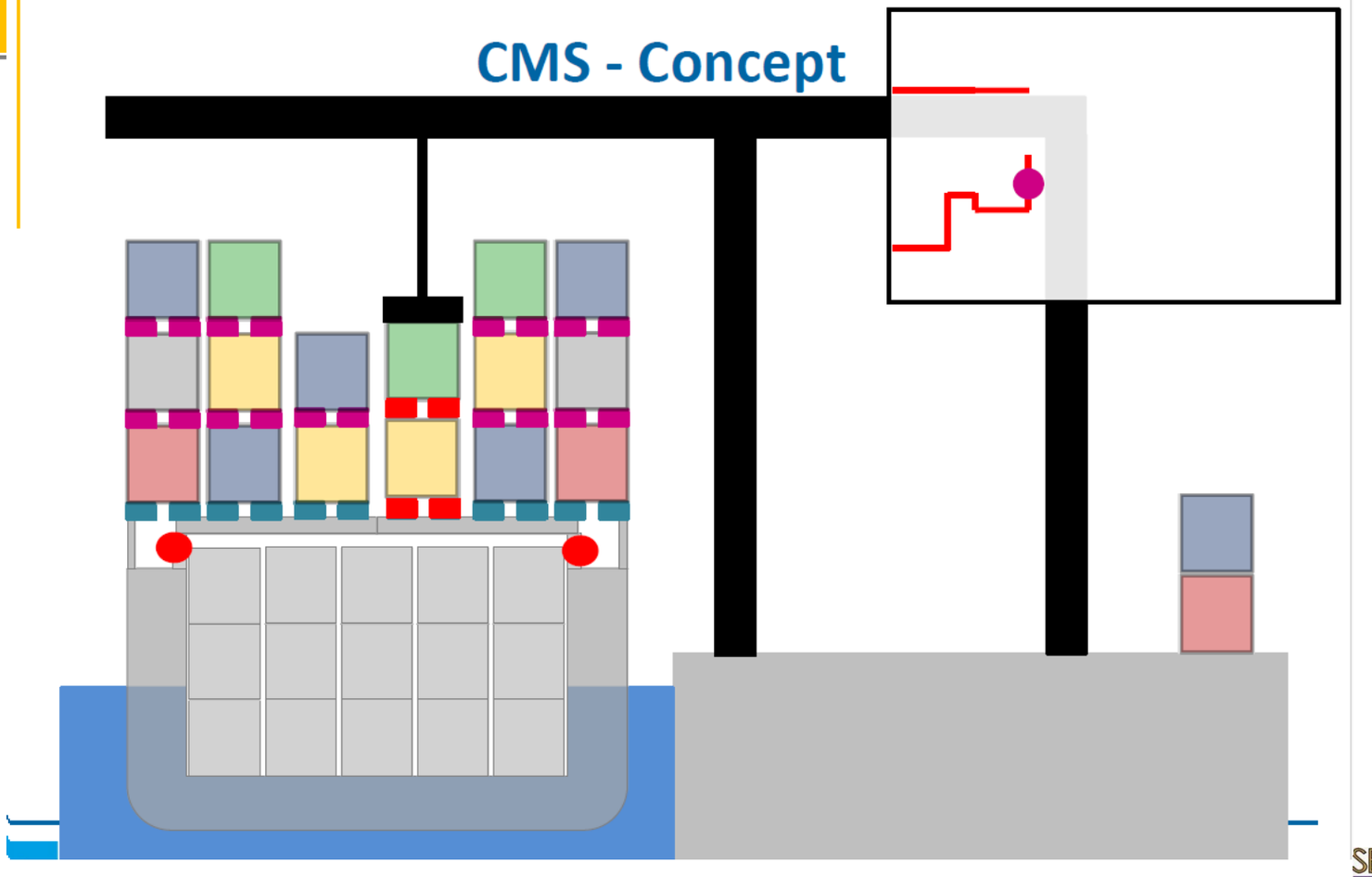

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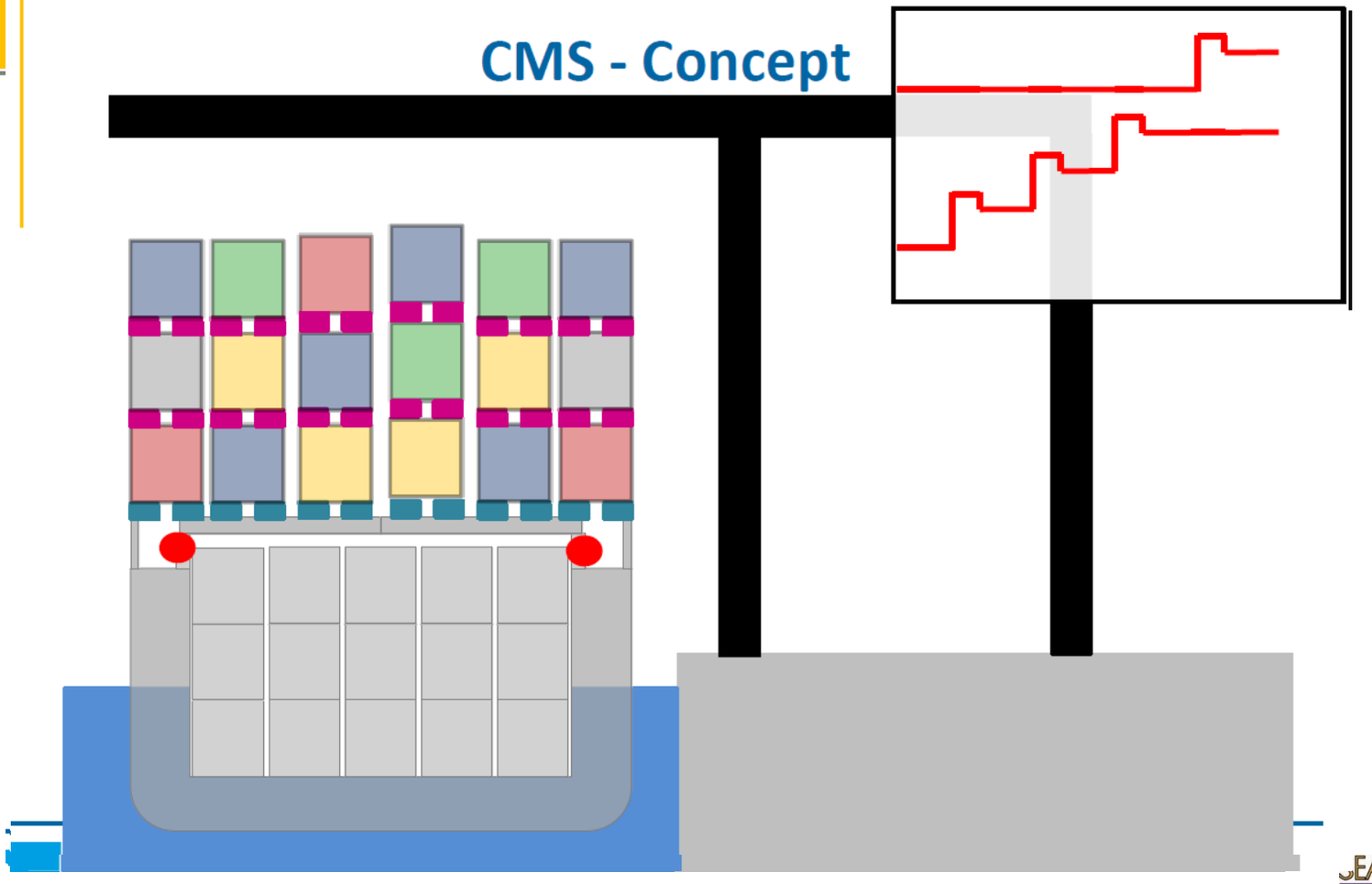

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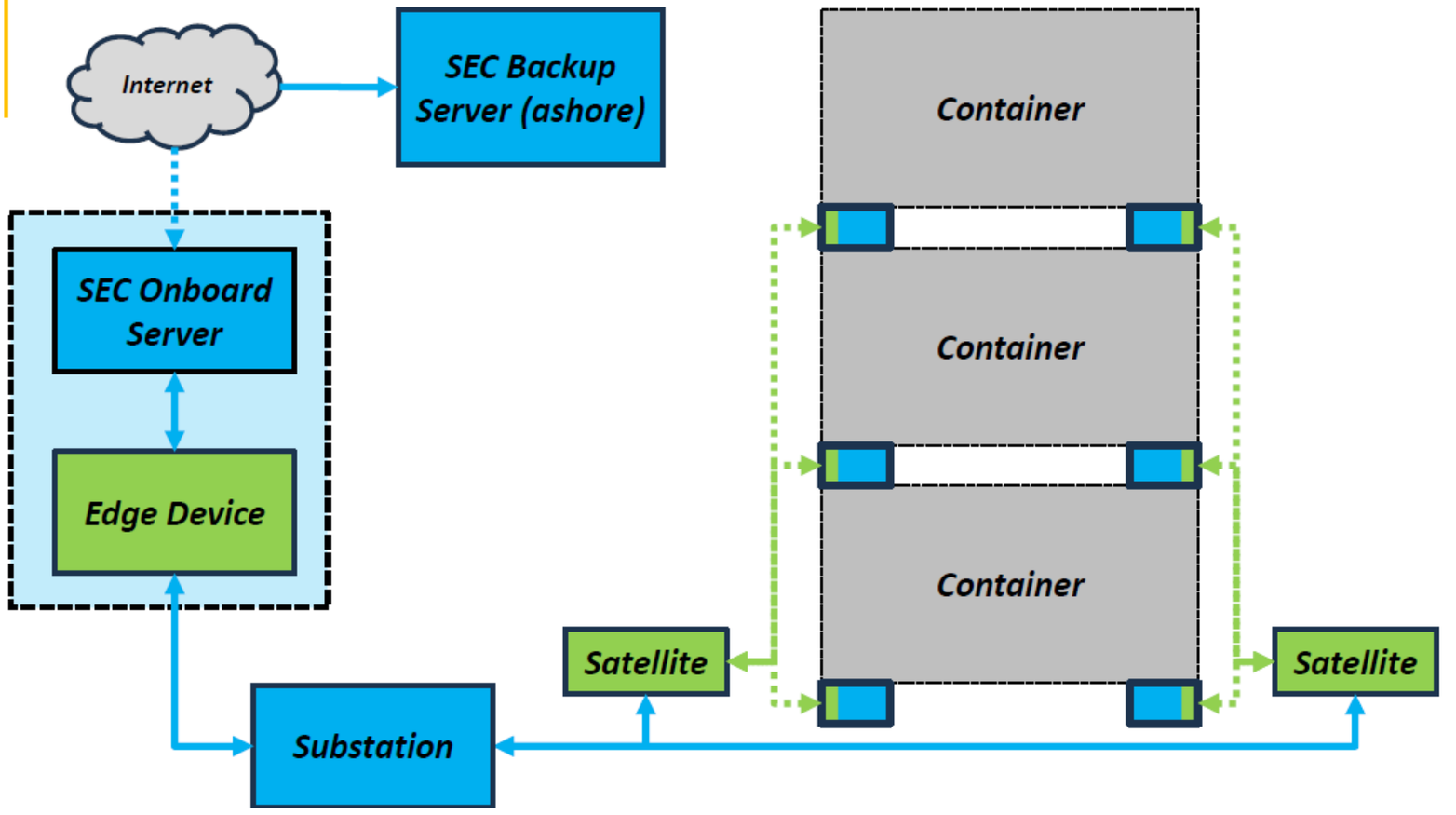
SEC Container Monitoring System (CMS)

CMS – System Overview



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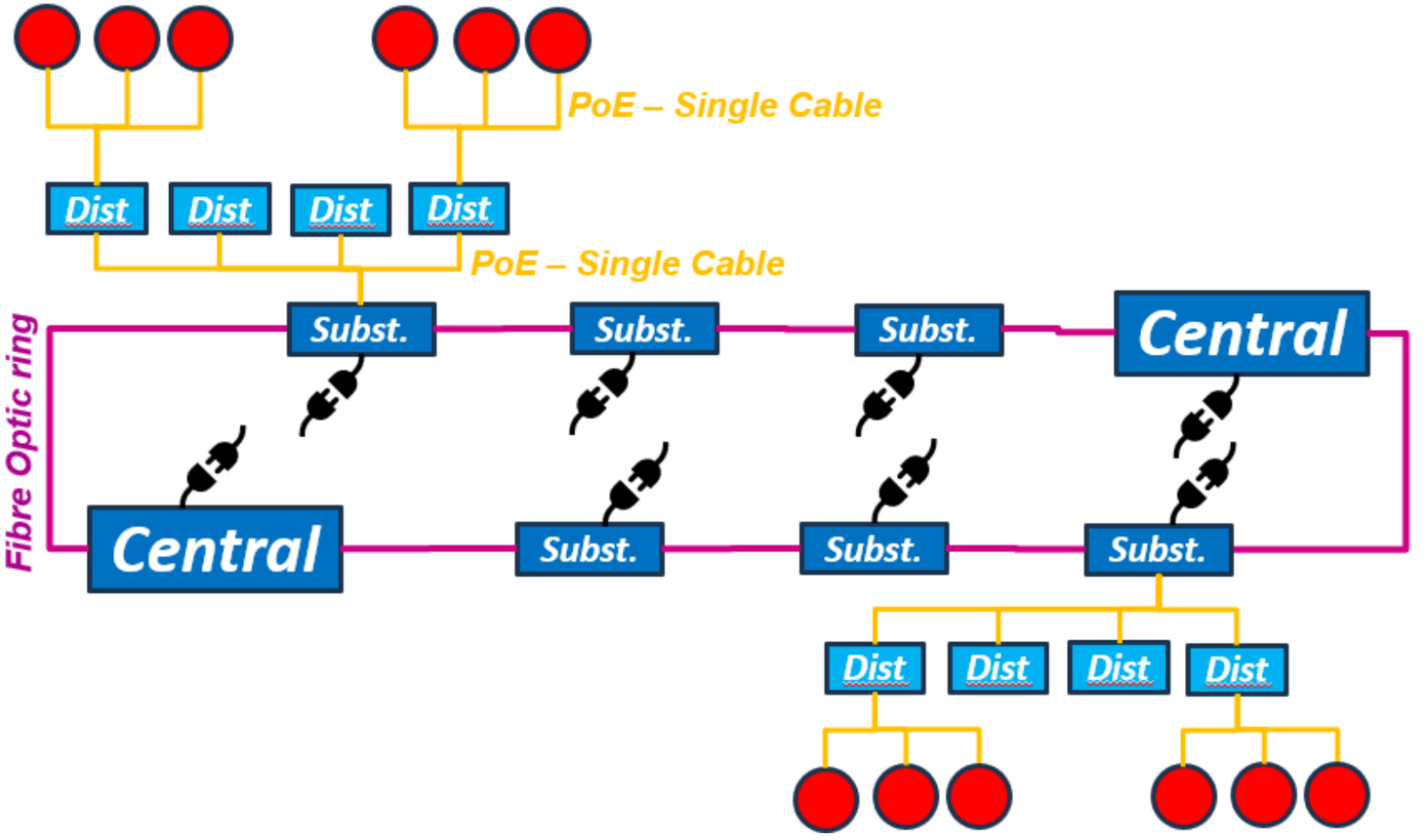
SEC Container Monitoring System (CMS)
- Installation Design



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SEC Container Monitoring System (CMS)

CMS – Fixed Components

Satellites

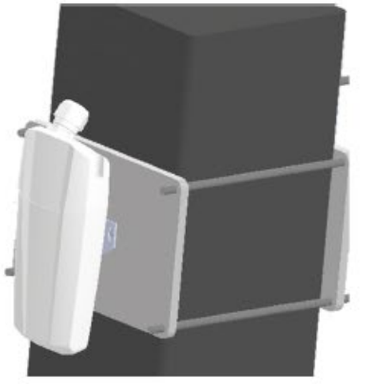
- IMU Sensor (ship movements)
- Antennae
- Power Over Ethernet supply

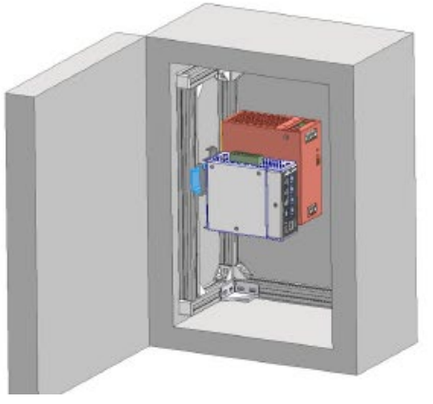
Central

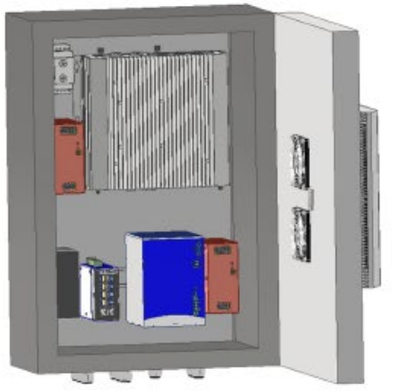
- Data Collection & Backup
- UPS, Heating, Cooling
- Internet Connection
- GPS Data

Substation

- Range Extension for PoE







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SEC Container Monitoring System (CMS)
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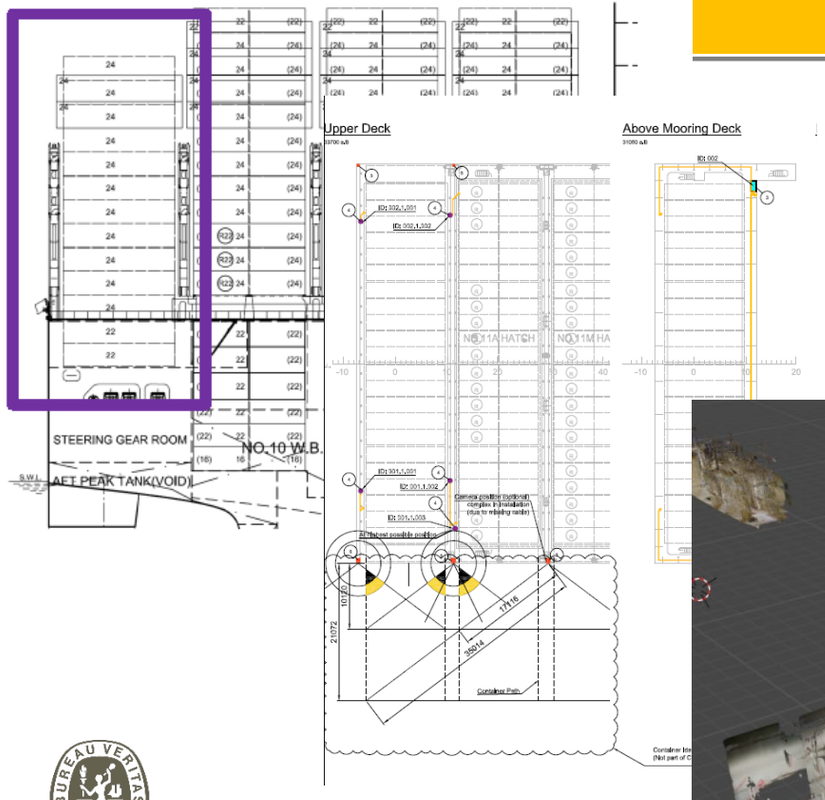

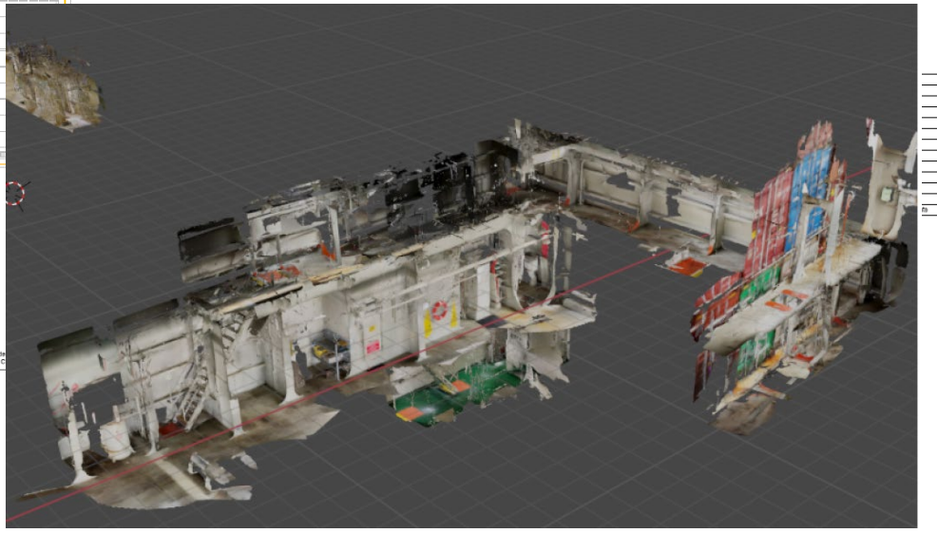

SEC BREMEN — A CIG COMPANY

Scale: 1:400	Tot. Weight=	
Item Code:		
Arrangement Scheme Fore		
drawn 27.11.2023 HSC		
proved		
CMS Agmnt.	CMS Arrangement	3/5
Name Type	Drawing Number	Sheet

BUREAU VERITAS 1828

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SEC Container Monitoring System (CMS)

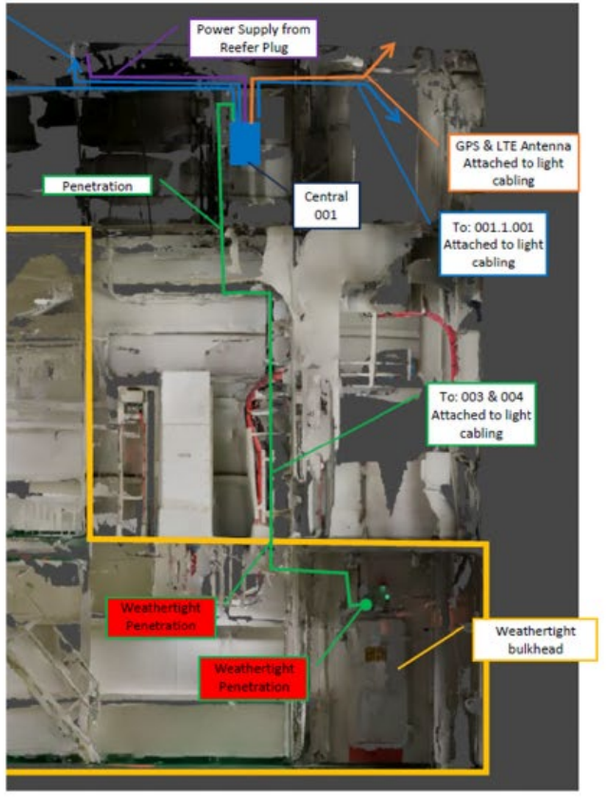
CMS - Installation

Radio Frequency

- 2.4 GHz ISM Band (ZigBee Standard)
- Communication 128AES Encrypted
- IT System completely independent

Installation

- Mooring Deck to Passageway Penetrations
- Power Supply via Reefer or other plugs (to be installed?)
- Removable clamps for fixation of components



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SEC Container Monitoring System (CMS)

CMS – Development

Hardware

- Weight Measuring Bottom Lock
- Fire Detection Intermediate Lock

Software

- System Control
- Data Collection
- Weight Determination
- Fire Detection & Evaluation

Installation

- All installation by SEC

ZIGPOS

- Wireless Data Logistics
- Network Anchors with Accelerometer (satellites)
- Time Synchronized Network
- Bi-directional Communication
- Highly Energy Efficient
- System capable of operating in highly reflective environment (steel)

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SEC Container Monitoring System (CMS)

CMS – Specific Goals

Fraunhofer IGP

- Real Time evaluation of incurring loads
- Reinforced AI Model to improve FEM model based on Load Measurements
- Short Prediction of expected loads based on FDS/TUHH accelerations

Fluiddynamik und Schiffstheorie

- Evaluation of Cargo Vessel movement interaction
- Reinforced AI Model connecting weather, course, speed to accelerations
- Short term prediction of loads
- Warning in case of expected excessive rolling
- Towing tank trials

SEC Container Monitoring System (CMS)

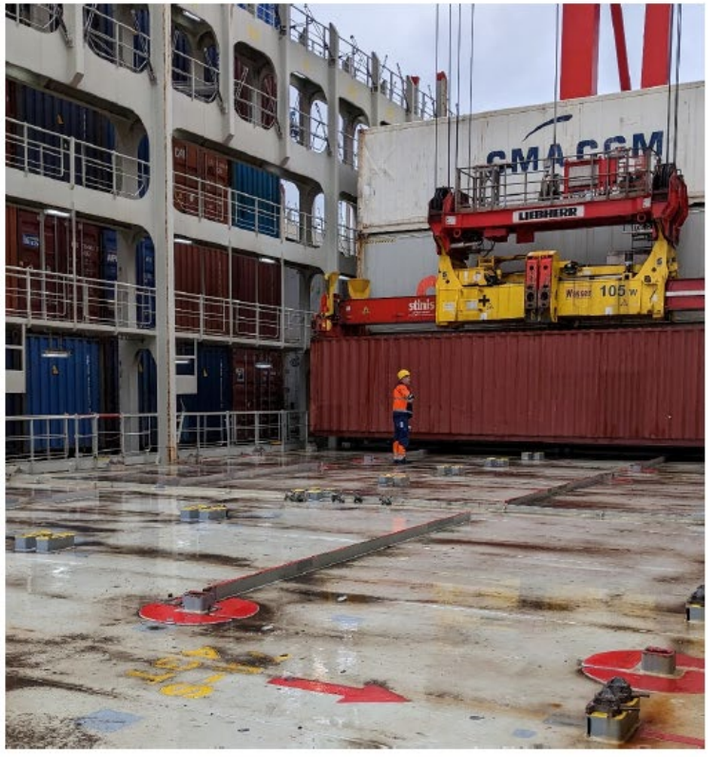
CMS - Operation

Operation

- Twistlocks are operational without any digital enhancement
- Twistlocks certified by BV
- Typical Twistlocks & operation
- System operates autonomously
- Twistlocks & Bins for Bay 94 operation in distinct colour
- Regular inspections/replacements in Europe (if required China) by SEC

Data Obtained During Operation

- Final Container Loading & Weights
- Loading condition(s) during voyage (min start/end)



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Application & Timeline

- Newbuildings & Existing Vessels
- Return on Investment

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Thank you very much for your attention!

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Speicherhof 5
28217 Bremen

Innovation made in Bremen
Cargo-Securing Systems

Worldwide service

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30 YEARS

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