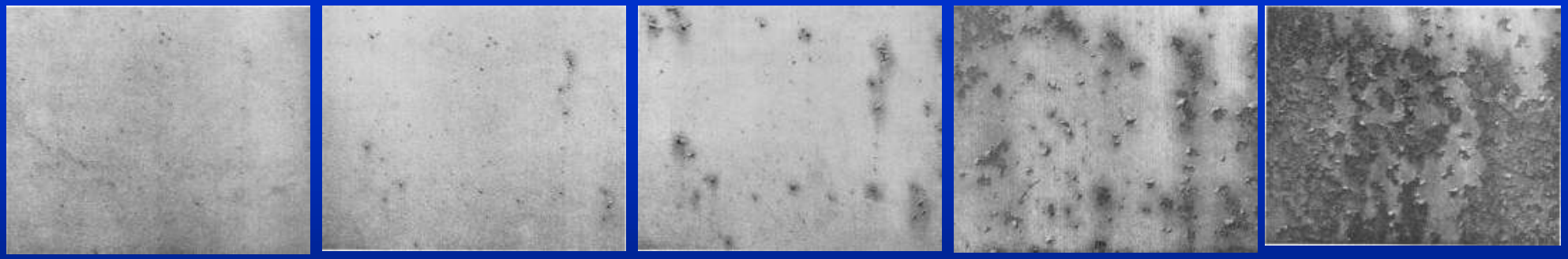
ISO 12944 – 防腐年限
Durability

- 防腐年限：涂层第一次大修前的年限。失效的判据由相关各方协定，例如基于 ISO 4628-3, Ri2 或 Ri3

  Durability of corrosion protection: The level of coating failure prior to first major maintenance painting. Agreed between interested parties (based on ISO 4628-3), *e.g. Ri2 or Ri3*

ISO 4628-3



Ri 1 - 0.05% **Ri 2 - 0.5%** **Ri 3 - 1%** **Ri 4 - 8%** **Ri 5 - 40 – 50%**

ISO 12944 – 防腐年限
Durability

- 不是涂装系统的担保时间! – 类似于工程中的“设计寿命”
  It is expected life time - NOT guarantee time!

- 表示为 3 个范围:
  It is expressed in terms of 3 ranges

Durability 防腐年限	Range 范围
Low (L) 低	2 to 5 years 2 至 5 年
Medium (M) 中	5 to 15 years 5 至 15 年
High (H) 高	Greater than 15 years 大于 15 年

ISO 12944 -大气腐蚀环境的分类
Classification of Atmospheric Corrosive Environments

腐蚀等级 Durability	重量损失 Mass Loss, g/m^2	举例 - 外部环境 Exterior Environment Examples	举例 – 内部环境 Interior Environment Examples
C1, C2 很低 V. Low, 低 Low	<10-200	乡村 / 干燥的区域, 低污染 Rural / dry areas, low pollution	被加热 / 不被加热的建筑物 Heated / unheated buildings
C3 中 Medium	200-400	中等程度 SO_2 污染的城市, 例如, 桂林 Moderate SO_2 polluted city. E.g. Guilin	Production rooms with high humidity
C4 高 High	400-650	工业地区 和中等盐度的海岸地区 Industrial areas and coastal areas with moderate salinity	化工厂, 游泳池 Chemical plants, swimming pools
C5-I (工业) 很高 Very High	650-1500	具有高湿度和苛刻大气环境的工业地区 Industrial areas with high humidity and aggressive atmosphere	几乎长期有冷凝水 / 重污染的建筑物或区域 Buildings or areas with almost permanent condensation / high pollution
C5-M (海洋) 很高 Very High	650-1500	海岸和离岸地区 Coastal and offshore areas	

ISO 12944 – 涂装防护系统
Protective Coating System

- 结合所需的防腐年限以及钢结构所在的腐蚀环境，可以得到防腐涂装系统所需的干膜厚度。

  By combining the DURABILITY requirement and ENVIRONMENT can be used to put a matrix of time to 1st maintenance and Dry Film Thickness.

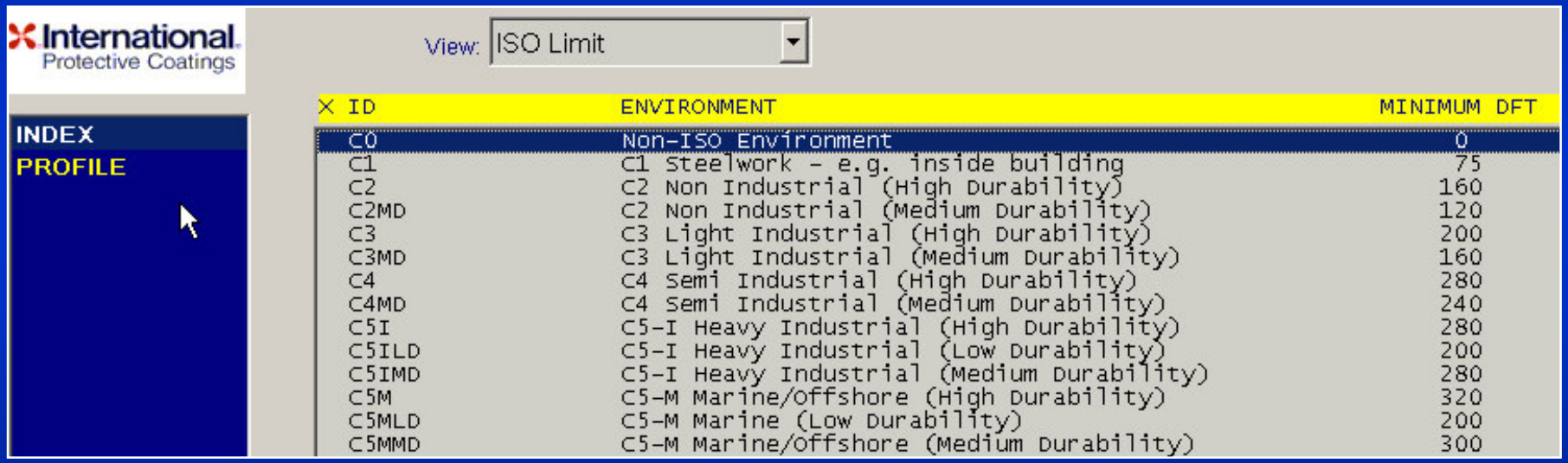
- 例如，对于 C4 的腐蚀环境以及高的防腐年限（ >15 年），所需的涂层系统的最小干膜厚度为 280 微米。

  For example a DFT of 280 microns is required for a High Durability (>15 years) for a C4 environment.

ISO 12944 – 涂装防护系统
Protective Coating System

- 国际油漆公司的软件程序 *Interspec* 完全按照 ISO12944 的技术参数检查涂装系统

  International *Interspec* holds all the parameters and provides technical checks against the ISO12944 DFT limits



ID	ENVIRONMENT	MINIMUM DFT
C0	Non-ISO Environment	0
C1	C1 Steelwork - e.g. inside building	75
C2	C2 Non Industrial (High Durability)	160
C2MD	C2 Non Industrial (Medium Durability)	120
C3	C3 Light Industrial (High Durability)	200
C3MD	C3 Light Industrial (Medium Durability)	160
C4	C4 Semi Industrial (High Durability)	280
C4MD	C4 Semi Industrial (Medium Durability)	240
C5I	C5-I Heavy Industrial (High Durability)	280
C5ILD	C5-I Heavy Industrial (Low Durability)	200
C5IMD	C5-I Heavy Industrial (Medium Durability)	280
C5M	C5-M Marine/Offshore (High Durability)	320
C5MLD	C5-M Marine (Low Durability)	200
C5MMD	C5-M Marine/Offshore (Medium Durability)	300

低于 ISO 12944 所规定的涂层干膜厚度，就是违背了国际标准 ISO 12944

If the film thickness of a coating system is lower than ISO 12944 specified, the coating system does not comply with ISO 12944.



涂层系统的性能测试

Performance Testing Methods for Coating System

International

AKZO NOBEL

循环腐蚀实验和静态盐雾实验
Dynamic cyclic corrosion tests and static salt fog test

- 盐雾实验的实验条件是静态的
  The test condition for salt fog is static
  - ASTM B117, ISO 7253, GB/T 1771

- 循环腐蚀实验（CCT）包括了温度的波动、紫外线的照射、干湿交替的动态循环实验条件。
  Cyclic corrosion tests include temperature fluctuation, UV exposure, dry/wet - The test condition is dynamic.

  - 更接近实际的工况 Close to real environment
  - NORSOK M-501
  - ASTM D5894
  - NACE（起草 Draft）
  - ISO 20340（起草 Draft ）

循环腐蚀实验和静态盐雾实验
Cyclic corrosion tests and salt fog test

循环腐蚀实验标准 CCT Standards	描述 Description
NORSOK M-501	▪ 72小时人工海水盐雾实验 (ISO 7253, ASTM B117, GB/T 1771) 72 hours Neutral Salt Spray ▪ 16小时干燥（23°C） 16 hours dry out at ambient temperature ▪ 80小时60°C紫外线照射/50°C湿热实验（每4小时交替） (ASTM G53, GB/T 1865, GB/T 1740) 80 hours UV/Condensation, 4 hours UV at 60°C, 4 hours condensation at 50°C 总共：25个周期，4200小时（25个星期） Test duration – 25 weeks (4200 hours)

NORSOK M-501

通过NORSOK M-501的判据

NORSOK M-501 Acceptance Criteria

划痕腐蚀宽度: 小于 3 毫米	Corrosion creep from scribe: less than 3mm
不起泡 (ISO 4628-2): 0 级	Blistering (ISO 4628-2): Rating 0
粉化 (ISO 4628-6): 最高 2 级	Chalking (ISO 4628-6): Max. Rating 2
不锈蚀 (ISO 4628-3): 0 级	Rusting (ISO 4628-3): Rating 0
不开裂 (ISO 4628-4): 0 级	Cracking (ISO 4628-4): Rating 0

附着力: 最小为5 MPa，而且测试后的附着力不能小于测试前的 50%

Adhesion (ISO 4624): Min. 5.0 MPa and max. 50% reduction from original value

循环腐蚀实验和静态盐雾实验
Cyclic corrosion tests and salt fog test

循环腐蚀实验标准 CCT Standards	描述 Description
ISO 20340 (草稿 Draft)	▪ 72小时人工海水盐雾实验 (ISO 7253, ASTM B117, GB/T 1771) 72 hours Neutral Salt Spray ▪ 24小时冷冻 （-20°C） 24 hours freeze ▪ 72小时60°C紫外线照射/50°C湿热实验（每4小时交替） (ASTM G53, GB/T 1865, GB/T 1740) 72 hours UV/Condensation, 4 hours UV at 60°C, 4 hours condensation at 50°C 总共：25个周期，4200小时（25个星期） Test duration – 25 weeks (4200 hours)

International

AKZO NOBEL

循环腐蚀实验和静态盐雾实验
Cyclic corrosion tests and salt fog test

循环腐蚀实验标准 CCT Standards	描述 Description
ASTM D5894	▪ 168小时ASTM G85实验 168 hours ASTM G85 ▪ 168小时60°C紫外线照射/50°C湿热实验（每4小时交替） (ASTM G53, GB/T 1865, GB/T 1740) 168 hours UV/Condensation, 4 hours UV at 60°C, 4 hours condensation at 50°C 总共：12个周期，4032小时（24个星期） Test duration – 24 weeks (4032 hours)
GB/T 1771	5% NaCl, 35°C – 静态实验 Static Test