

# **ONR Transport Permissioning Stakeholder Event**

20% NCT Regulation

# Introduction

- The NCT 20% regulation & guidance – quick overview
- Issues & ONR view on how they can be resolved
- Future changes to ‘improve’ the regulation

# The Regulation

e.g. 624. A package to be qualified as Type IP-2 shall be designed to meet the requirements for Type IP-1 as specified in para. 623 and, in addition, if it were subjected to the tests specified in paras 722 and 723, it would prevent:

(b) More than a 20% increase in the maximum radiation level at any external surface of the package.

# The Regulation -scope

- CA approved, self-approved
- IP-II\*, IP-III, Type A, Type B, Type C
- New designs, mods, renewals, validations *etc.*
- Damage/movement to packaging, furniture or source(s).
- Other effects e.g. neutron multiplication (as a consequence)

\* Only free drop & stacking tests apply to IP-2 [722 & 723]

# History

Regs	RCT	NCT	ACT	Notes
1961	2mSv/h @ contact	-	-	Different for Cat I, II, III
1967	2mSv/h @ contact	-	10mSv/h @ 1m	Testing brought in (doesn't differentiate between NCT/ACT)
1973	2mSv/h @ contact	No Increase following NCT	10mSv/h @ 1m	Requirement for intermediate NCT testing
1985	2mSv/h @ contact	<20% increase following NCT	10mSv/h @ 1m	No increase following NCT too restrictive so <20% introduced

## What the guidance (SSG-26) says

624.4. For packages exhibiting **little external deformation and negligible internal movement of the radioactive contents or shielding**, a careful visual examination may provide sufficient assurance that the surface radiation level is essentially unchanged.

624.5. If it is considered that the maximum surface radiation level has increased, monitoring tests should be performed to confirm this.

## Guidance *cont.*

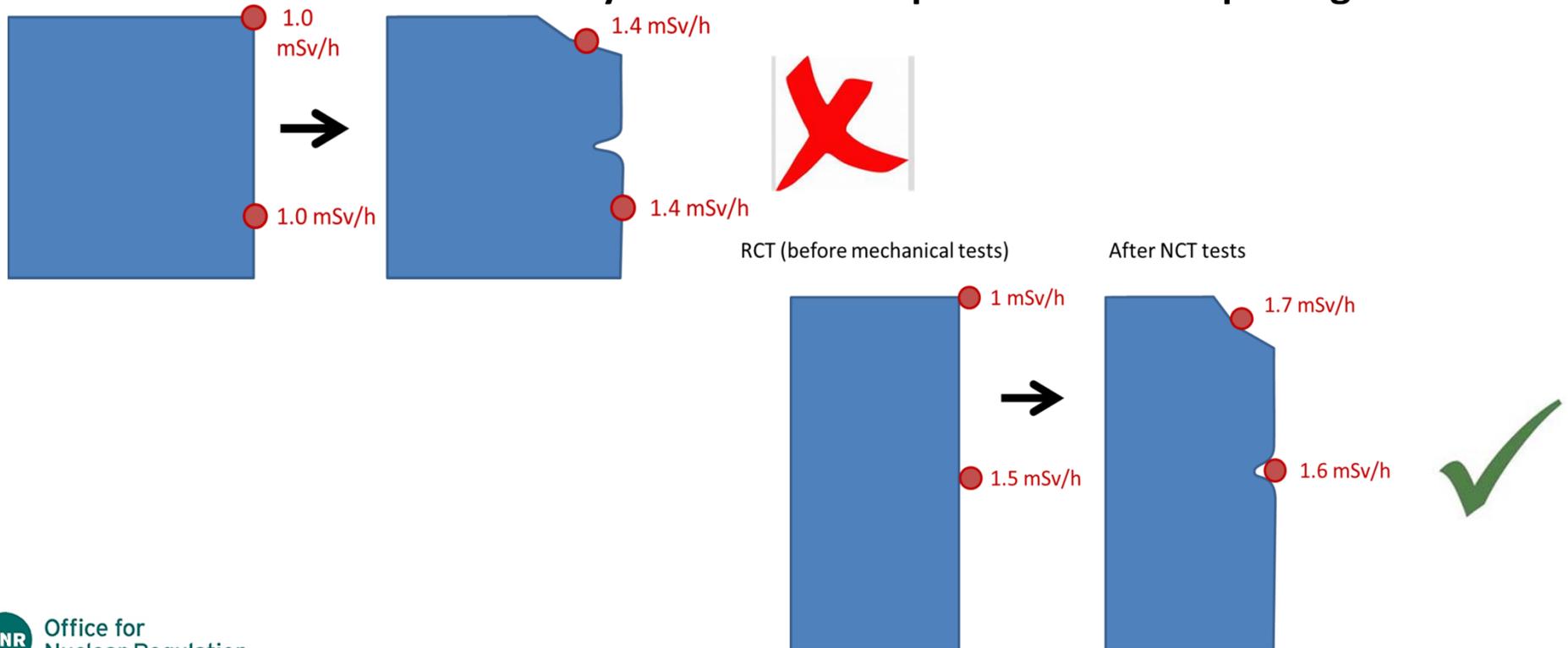
624.6. The method of evaluation of the increase in maximum surface radiation level varies from one design to another. This could lead to discrepancies in evaluating a package's capability to satisfy the requirements of para. 624(b).

**One way of overcoming this problem** may be to define the maximum surface area of the package over which the surface radiation level is assessed. Thus, for example, individual measurements may be taken over areas not greater than 10% of the total surface area of the package. The package surface may be marked to define the subdivisions to be considered and tests conducted by means of a test source suitable for the package (i.e. Co-60 or Na-24 for general package use or specific nuclides for a certain package design).

It may be necessary to consider the **effect of increased localized radiation levels** when evaluating surface dose rate increases.

# Guidance *cont.*

624.7. The increase in maximum radiation level should be evaluated on the basis of the measurements taken both before and after the tests specified in para. 624, and the resulting data should be compared to determine whether the package satisfies the requirement or not. **The pre- and post-test maximum radiation levels may be at different positions on the package.**



## Guidance *cont.*

624.8. The maximum radiation level should be determined taking into account potential amplifying phenomena, such as **internal movement of contents**, or, in the case of packages containing liquids, segregation and precipitation of the radionuclides.

# ***ONR expectations***

Ways to demonstrate compliance:

- **inspection** together with reasoned argument (if it is evident that there is little change/movement to package **and** sources)
- pre/post-drop **measurements** following inspection of a dummy source and replacement of a real source, taking into account measurement uncertainty, and realistically it may be difficult to replace the source if there has been movement to the furniture
- **FEA**
- **calculation**
- drop test data from another package **and** robust justification for why it is applicable
- **any combination** of the above, or method acceptable to the CA

# Issues with demonstration

*Little knowledge of what sources will be transported in the package at the design stage*

- Some characterisation of contents **is** always necessary
- Not acceptable to not know the size of the hazard
- Could cause **containment issues** e.g. if internal furniture and sources are not characterised, sharps or friction could puncture containment, and radiolysis or hydrolysis could occur
- may need **optioneering process** to determine:
  - a) **bounding case(s)** and
  - b) **solution or solutions** for ensuring and demonstrating that there won't be movement or damage of/to sources

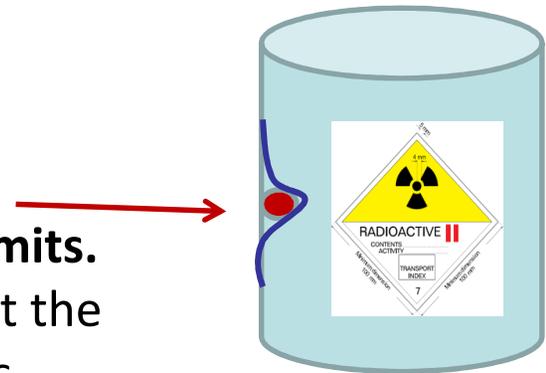
The outcome of the optioneering process needs to be **documented with calculations/reasoned argument**
- If the content changes later, may need to update safety case, or consider modifications to the package/using a different package

# Issues with demonstration

This regulation could drive perverse arrangements e.g. by putting source at edge of the package

Para 301:

**Doses to persons shall be below the relevant dose limits. Protection and safety shall be optimized** in order that the magnitude of individual doses, the number of persons exposed and the likelihood of incurring exposure shall be **kept as low as reasonably achievable**, economic and social factors being taken into account, within the restriction that the doses to individuals are subject to dose constraints.



And IRR (1999) is applicable

“All the law applies all the time when it says it does”

# Issues with demonstration

It's difficult to show that the source definitely won't move

- Need to consider the impact of Normal Conditions Tests. The most significant is likely to be the 0.3/0.6 /0.9/1.2 drop (depending on gross mass) for source damage or movement
- The internals need to give a reasonable confidence that the sources can't move or rattle around

# Issues with demonstration

The package is monitored before and after shipment and there is never any increase observed. There has been safe practice for 20+ years.

- Not proof of compliance with NCT conditions
- However **historical operational data can be provided as evidence and form part of safety case** to build picture of package performance.

**Bottom line:** We (ONR) need evidence to demonstrate to the public that any package meets all the requirements of regulations, and that there is no potential for increased doses to workers or the public due to minor mishaps

# Issues with demonstration

If this regulation has been in place for so long, why haven't we (ONR) looked at compliance in detail before now?

- With the change in IAEA regulation in 2012 (into effect 2015), meaning that routine conditions need to be demonstrated in design, increased resource was brought in to look at shielding and package dose rates → identified some inconsistent practices

.....but we think that resolution is not insurmountable

# Issues with demonstration

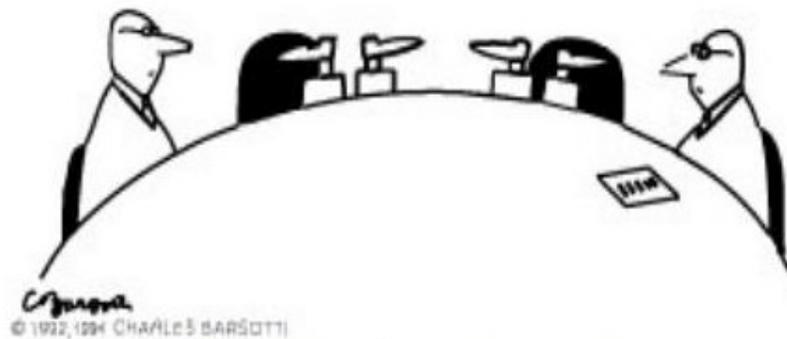
**We are not able to disregard any of the regulations ... however....** if a comprehensive case is submitted and there is a shortfall in compliance, alternative options can be explored (special arrangement or CDG Reg 12 Authorisation). **BUT....**

- **all potential solutions and combinations of solutions must be fully considered** with evidence, calculation and /or reasoned argument – **OPTIONEERING PHASE**
- the reasons for discounting potential solutions must be due to **safety, security or other strategic factors**. Difficult to accept arguments based on cost as they are already built into the Regulations
- in this case, the ‘compliance gap’ must be quantified and alternative measures identified to ensure **at least** the same level of safety that would be provided by complying with all the regulations. **NOT A SIMPLE ROUTE**

# Current and Future Proposed Changes to Regulations

- Minimum threshold – 10  $\mu\text{Sv/h}$  (US proposal, agreed by TRANNSC)
- Potential to increase this **in this revision round** if ‘bullet proof’ justification is given e.g. dose estimates for worst case scenarios and assumptions – what are those scenarios?
- Further future improvement desired by other MS – but would need to retain **intent** of regulation. The public won’t accept ‘loosening of the regulations’.
- Implementation of IAEA regs into GB law  $\rightarrow$  7ish yrs but ONR can be cognisant of any agreed changes that haven’t yet been implemented
- Regulation change needs **collaboration** – been thought about a lot but no agreed solution so far....

- thoughts?
- further issues and suggestions under current regulation?
- proposals for future changes to regulation?
- how can we work together on this?



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“The collaboration makes sense but  
it will take a while to understand them”