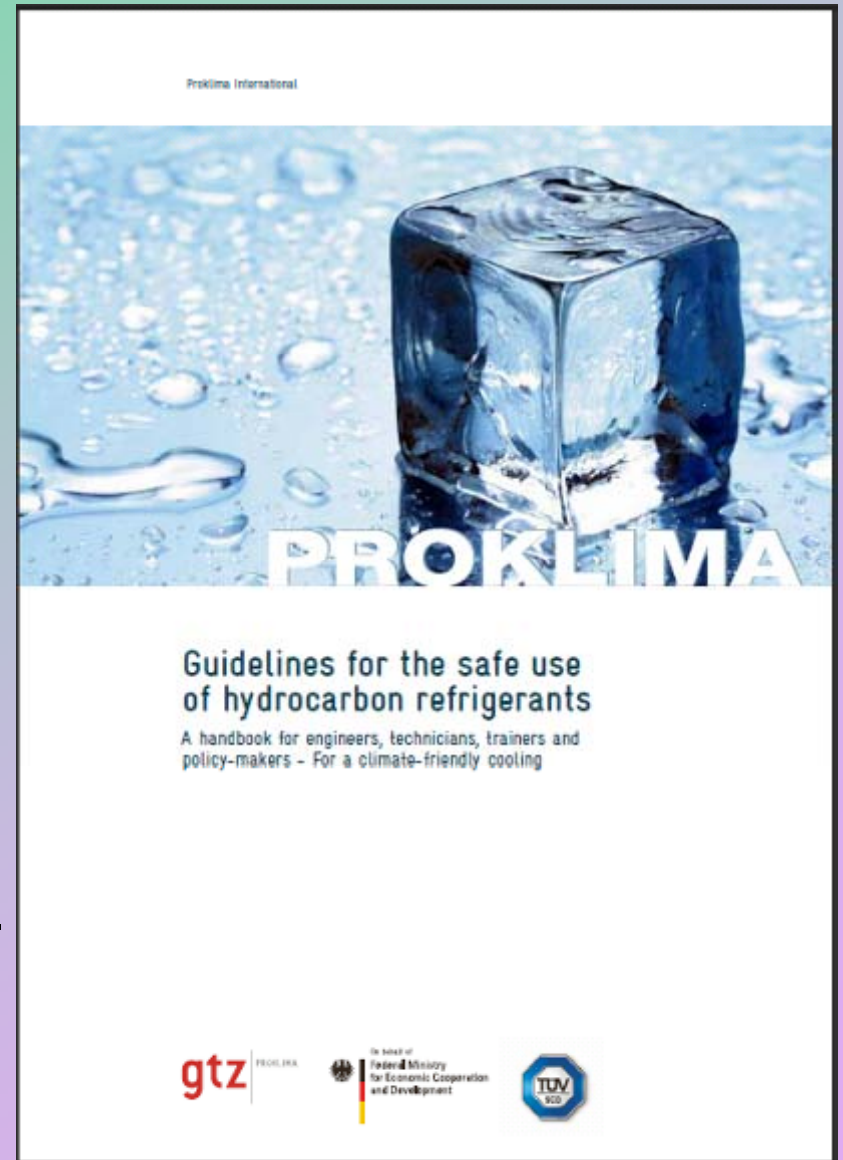


# Guidelines for the safe use of hydrocarbon refrigerants

*A handbook for engineers,  
technicians, trainers, and policy-  
makers*

## Objectives and elements of the handbook

Daniel Colbourne



# GTZ Proklima hydrocarbon safety handbook

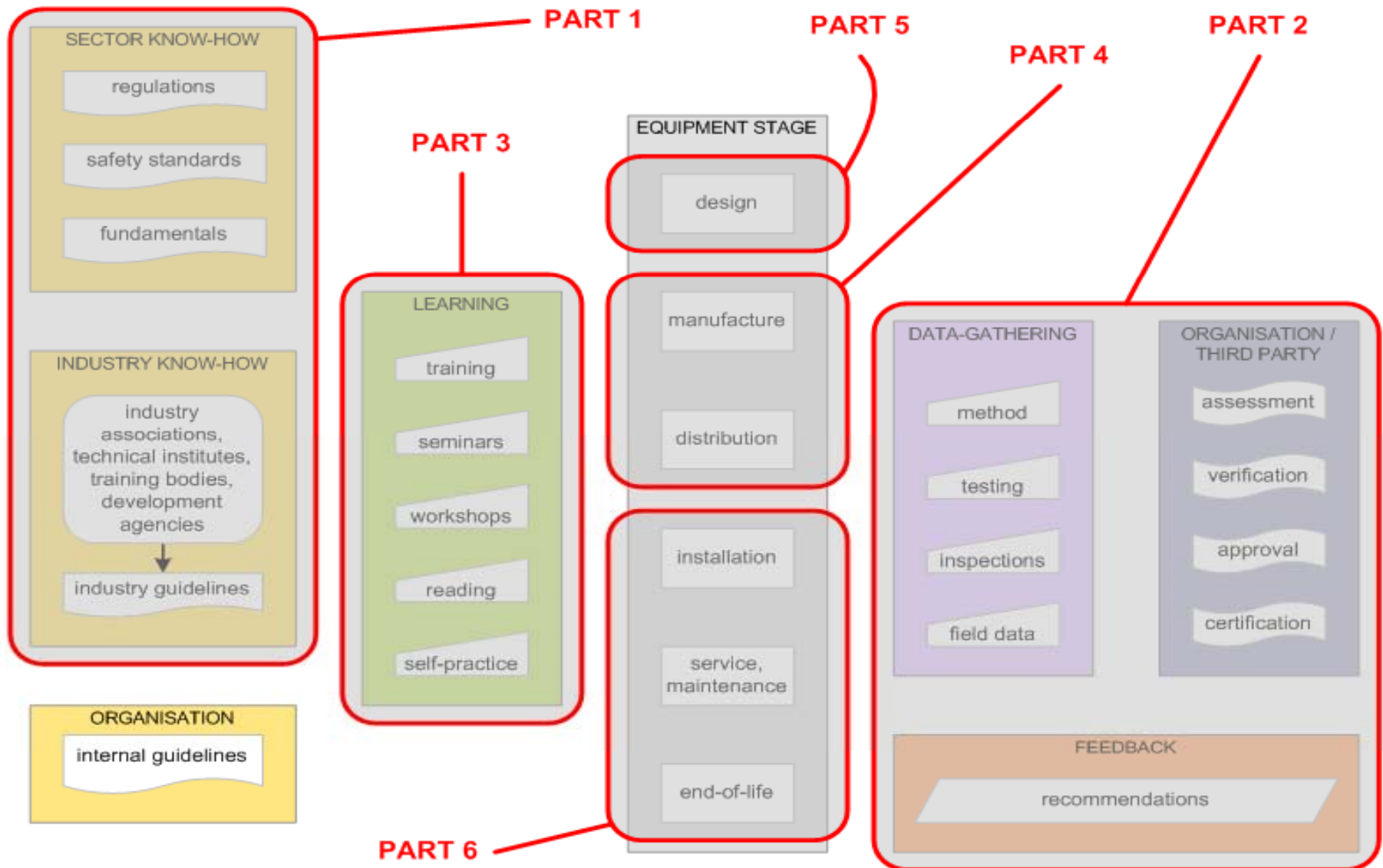
## Purpose

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- Much of the information relating to safe use of HCs is widely dispersed or difficult to find
  - Standards, industry guidelines, technical papers, service handbooks, textbooks, etc
  - Also, interpretation of rules is rarely easy
- Therefore, purpose of GTZ handbook is to provide a compilation of all relevant information, provide interpretation and fill the gaps relevant to all levels and stages
- Jointly produced with TÜV Süd to ensure safety issues are handled at highest level

# GTZ Proklima hydrocarbon safety handbook

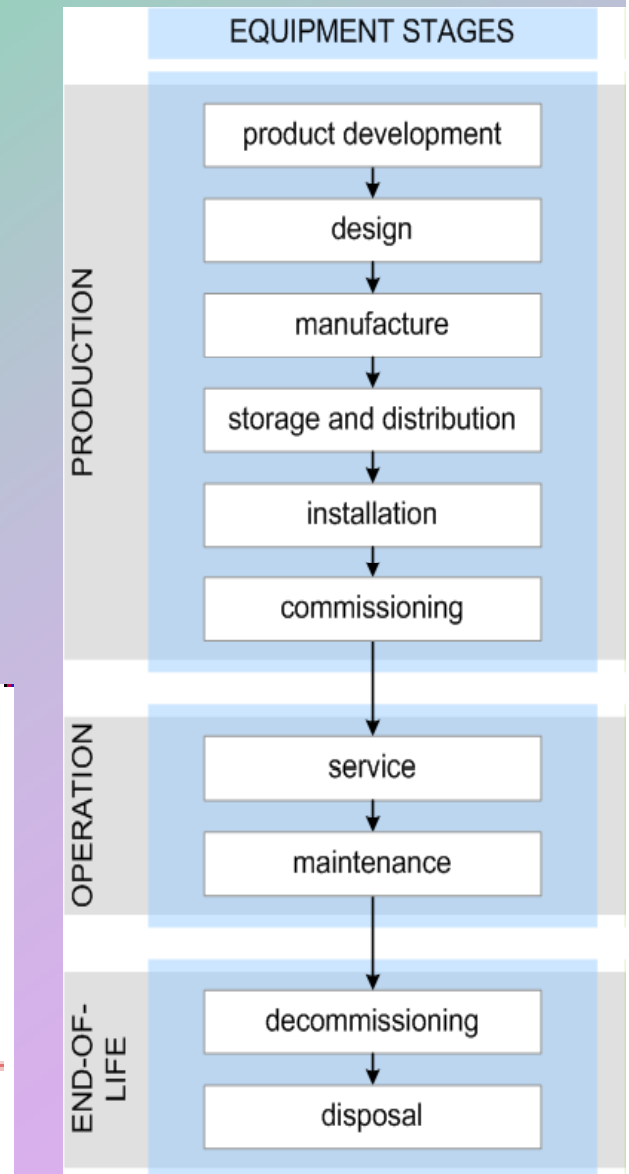
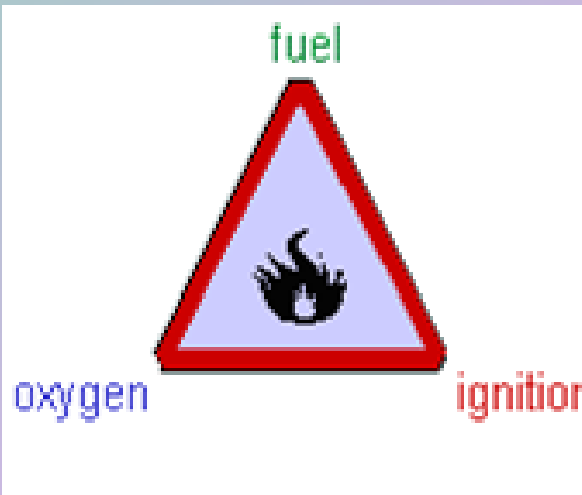
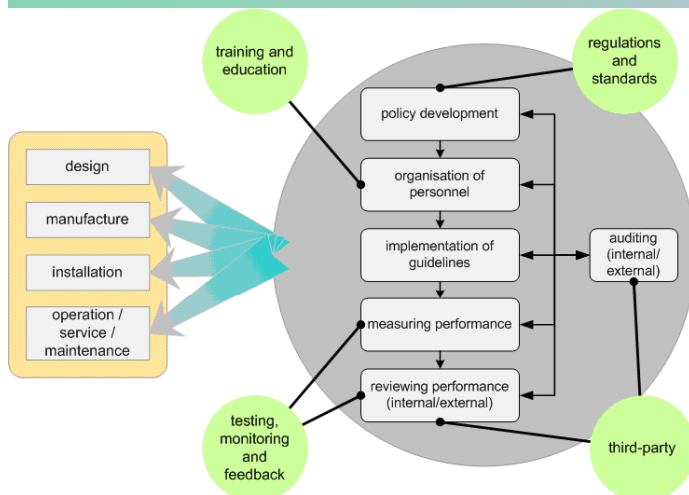
## Supporting activities for lifetime of equipment



# GTZ Proklima hydrocarbon safety handbook

## Part 1: Safety infrastructure

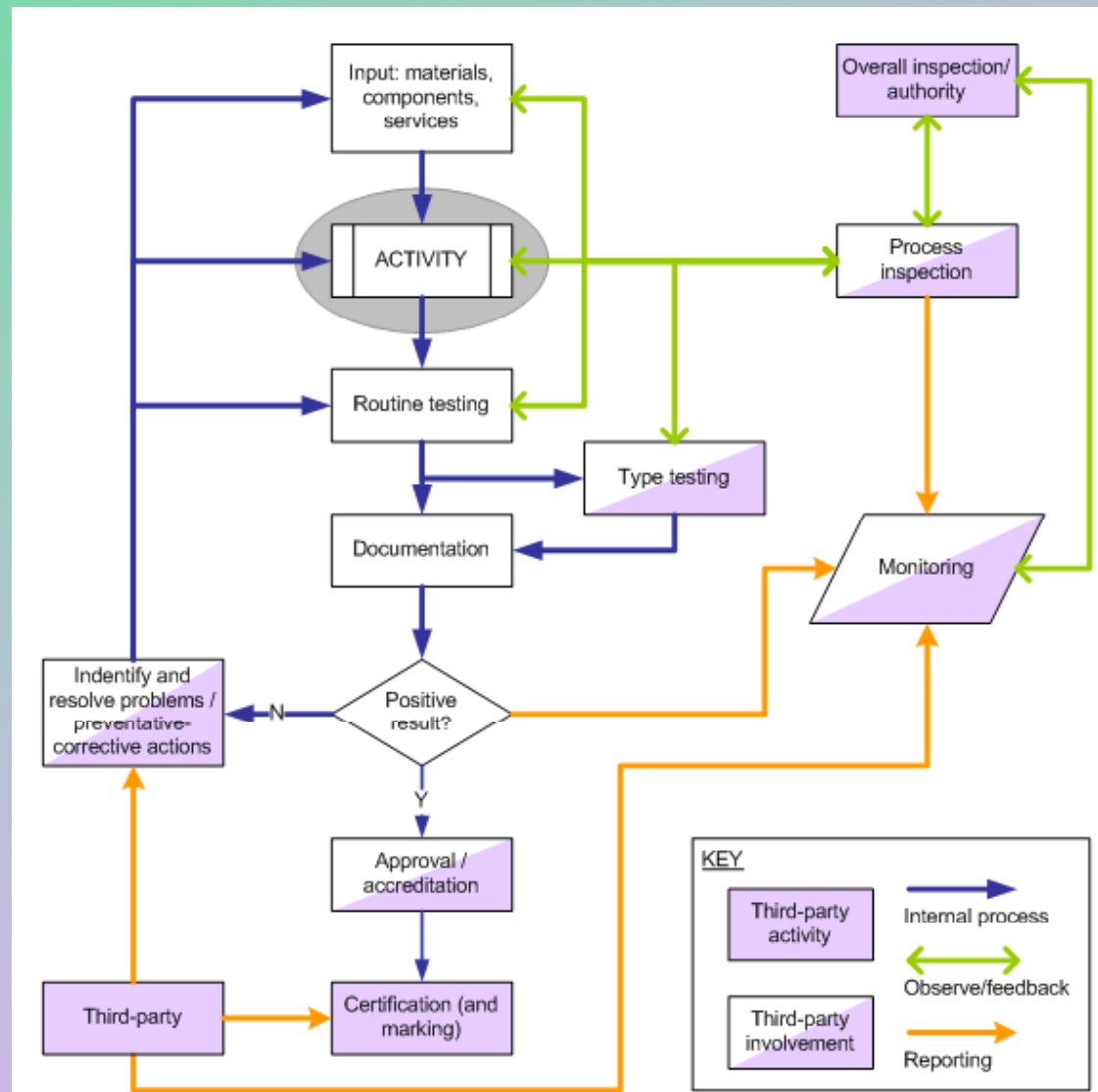
- Sections include:
  - Overview to the entire concept
  - Basic safety with flammable refrigerants
  - Development of safety management systems
  - Identification of cooperation partners
  - Framework of regulations and standards



# GTZ Proklima hydrocarbon safety handbook

## Part 2: Quality systems for safety

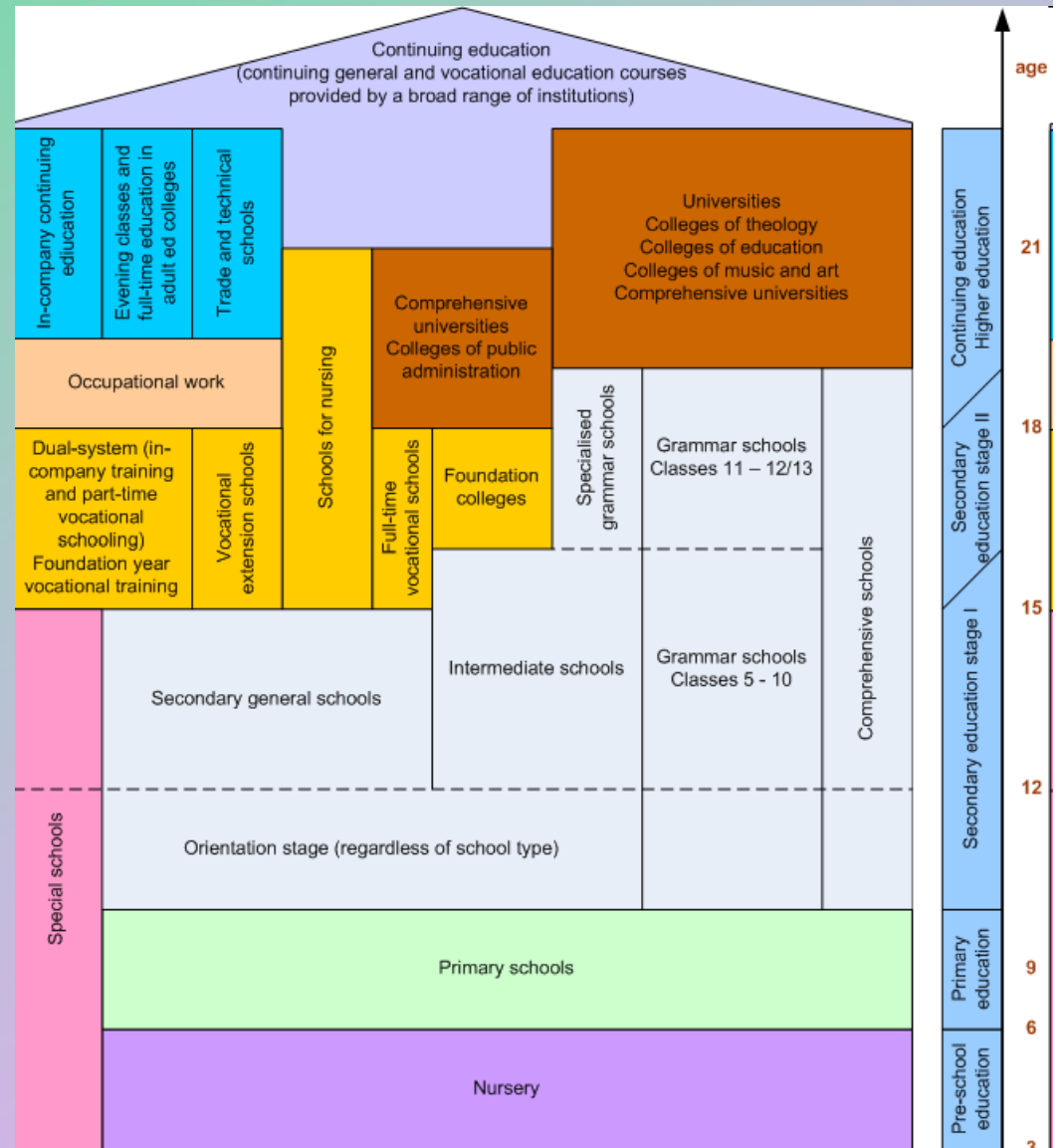
- Sections include:
  - Introduction
  - Feed-in elements (inputs)
  - Testing
  - Inspections
  - Monitoring
  - Feedback and preventative/corrective action
  - Accreditation and certification



# GTZ Proklima hydrocarbon safety handbook

## Part 3: Training

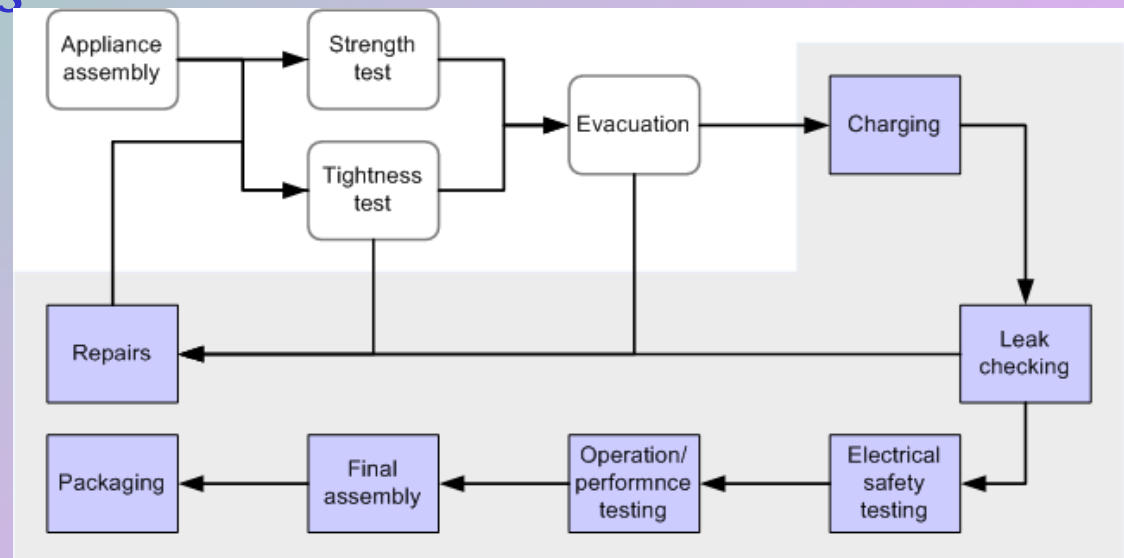
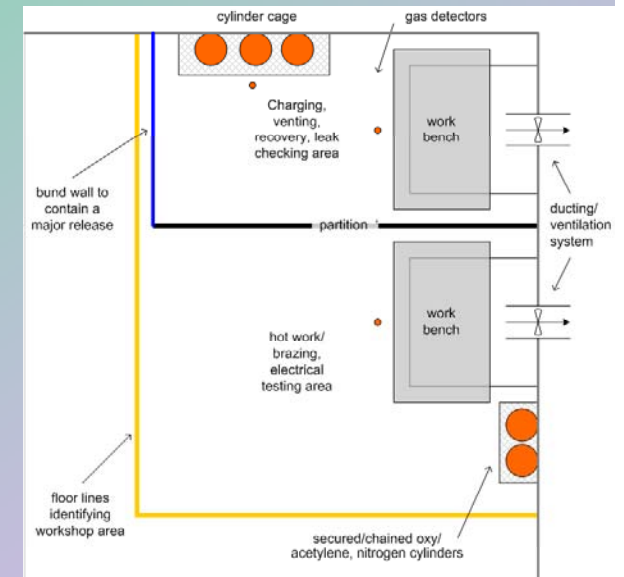
- Sections include
  - Introduction to training
  - Training facilities
  - Management system
  - Content for standard refrigeration training
  - Training for design and development
  - Training for production
- Supporting material provided within the Appendices



# GTZ Proklima hydrocarbon safety handbook

## Part 4: Production and manufacturing facilities

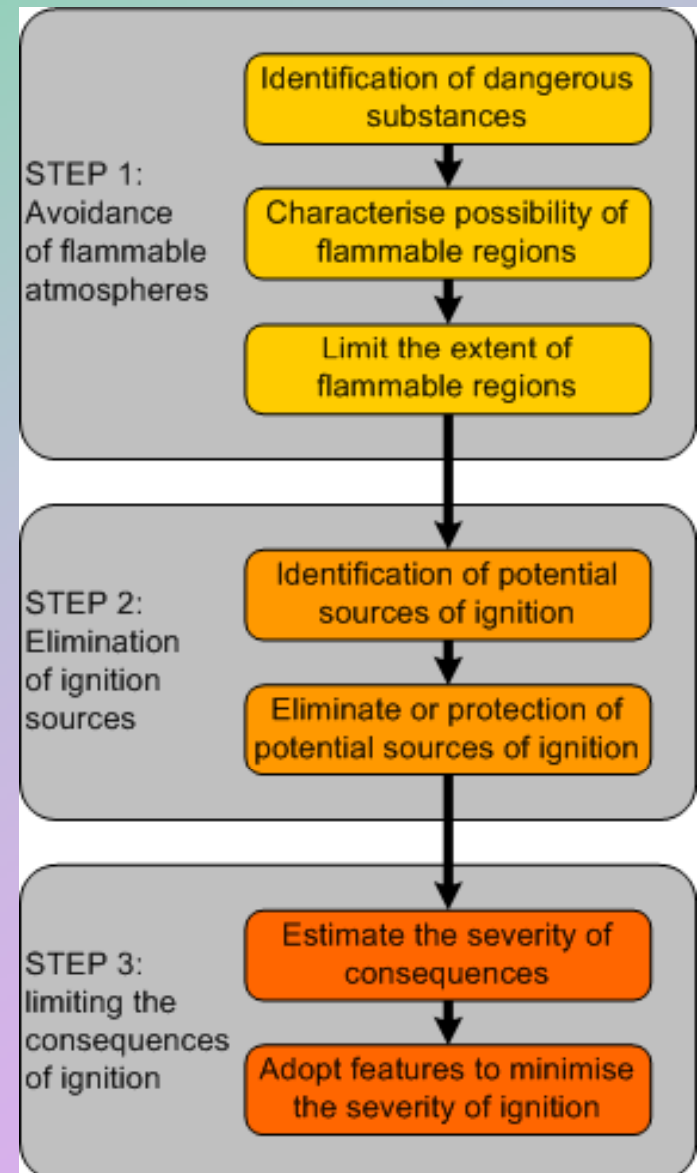
- Sections include:
  - Introduction
  - Refrigerant supply
  - Appliance production
  - Factory safety set-up
  - Workshop/repair areas
  - Carriage of systems
  - Storage of systems



# GTZ Proklima hydrocarbon safety handbook

## Part 5: Equipment design and development

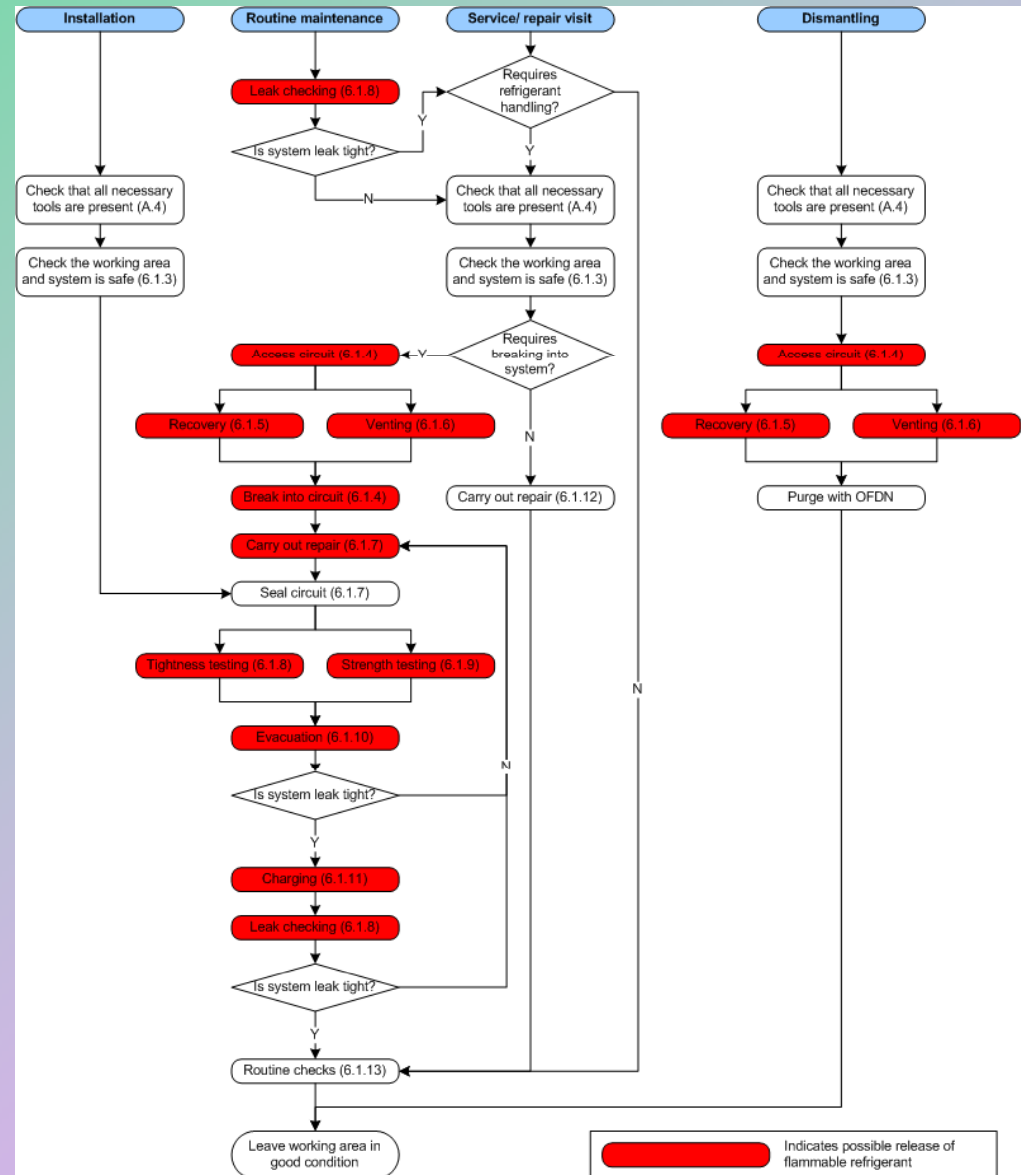
- Sections include:
  - Safe design for HC refrigerants
  - Avoidance of leakage
  - Refrigerant charge size limits
  - Charge size reduction
  - Sources of ignition/avoiding ignition
  - Design of system installation
  - Marking and instructions
  - Risk analysis



# GTZ Proklima hydrocarbon safety handbook

## Part 6: working on systems and equipment

- Sections include:
  - Technician activities and refrigerant handling
  - Installation of equipment
  - Commissioning of installations
  - On-site and workshop conversions
  - Dismantling



# GTZ Proklima hydrocarbon safety handbook

## "How to"

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- Technicians, manufacturers, suppliers, consultants, end users, etc, can easily use safety issues as an "excuse" to not use HCs
  - This excuse must be removed
- The purpose of the handbook is to provide stakeholders with comprehensive information on using HC safely
  - Essential to demonstrate that all the information is "there"
  - Important to ingrain knowledge in technicians, enterprises, etc.
  - How to think more broadly, long term, integrate safety concept into all activities
  - Provide information is available in many languages (handbook will be translated into Chinese, Spanish(?), Russian(?), etc

Thank you for your interest...

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