Development of a list of requirements for an integrated power supply system for laboratories

Développement d'une liste de pré-requis pour une bonne alimentation électrique des laboratoires

GOURLOT J.-P.

Arusha, January 2012

From a joint work by:

A partir d'un travail conjoint de :

Gourlot, Gallet and Payet

Cotton Testing in Africa

CSITC - Project

This project is co-funded by the European Union and the Common Fund for Commodities

Plan of presentation
Plan de présentation

- Introduction
- Survey / categorization
- Items taken into account
- General organization
- One example of sequence
- Recommended typical installation
- Sizing of the installation
- Conclusion

- Introduction
- Enquête / catégorisation
- Eléments pris en compte
- Organisation générale
- Un exemple de séquence
- Installation typique recommandée
- Dimensionnement de l'installation
- Conclusion

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Introduction
Introduction

During expertise tours, we observed that:

- Laboratories do not always benefit from a stable, permanent and safe power supply for their equipments.
- Consequently, electric devices and or electronic boards can be / are damaged

Pendant nos tours d'expertises, nous avons observé que :

- Les laboratoires n'ont pas toujours accès a une source stable, permanente et sûre d'électricité pour leurs équipements
- En conséquence, les appareils électriques et les cartes électroniques peuvent être ou sont endommagées

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Introduction
Introduction

During expertise tours, we observed that:

- Laboratories have to face to higher maintenance costs and losses in operational capacities driving into delays for the classification of their productions.

Pendant nos tours d'expertises, nous avons observé que :

- Les laboratoires doivent faire face à des coûts et des pertes de capacités opérationnelles conduisant à des délais dans la classification des productions.

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Survey / categorization
Enquête / catégorisation

- Is any power supply public grid available for the laboratory?
- Is the laboratory in town or in the countryside? Is the laboratory close to a gin having its own power supply to supply its needs?
- Is the power supply permanent or erratic? What is the estimated frequency of the power failure?
- How important is the power installed and used by the laboratory?

- Existe-t-il une fourniture d'électricité pour le laboratoire ?
- Le laboratoire est-il en ville ou loin de la ville ? Est-il prêt d'une usine d'égrenage ayant sa propre fourniture d'électricité ?
- La fourniture est-elle permanente ou non ? Quelle est la fréquence estimée des coupures ?
- Quelle est la puissance installée et utilisée au laboratoire ?

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Survey / categorization
Enquête / catégorisation

- Is the power supply stable? Is there any peak?...
- When available, is the general power generator available for the whole building or is itavailable solely for the laboratory?
- Is UPS available for each instrument or is it a central one for all the installed equipments?
- Are the instrument manufacturers providing UPS for their own instruments?

- Le courant est-il stable ? Y a t-il des pics ?
- Quand il y en a un, le générateur est-il pour tout le bâtiment ou seulement pour le laboratoire ?
- Y a-t-il un onduleur (UPS) pour chaque instrument ou un central pour tous les équipements installés ?
- Les fabricants d'équipements fournissent-ils un onduleur pour leurs instruments

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Items taken into account
Eléments pris en compte

- One Air Management System (AMS) containing three systems:

  1) the command system with regulation sensors, 2) the AMS power system and 3) independent controlling / checking sensors

- One or several SITC Instrument(s)
- Some additional computers to collect the data
- One air compressor
- Lights
- Some additional instruments

- Une Centrale de Traitement d'Air (CTA) comprenant les trois systèmes :

  1) de commande avec les capteurs de régulation, 2) de puissance de la CTA et 3) de capteurs de contrôle indépendants

- Une ou plusieurs CMI
- Des ordinateurs pour collecter les données
- Un compresseur d'air
- L'éclairage
- Des autres instruments

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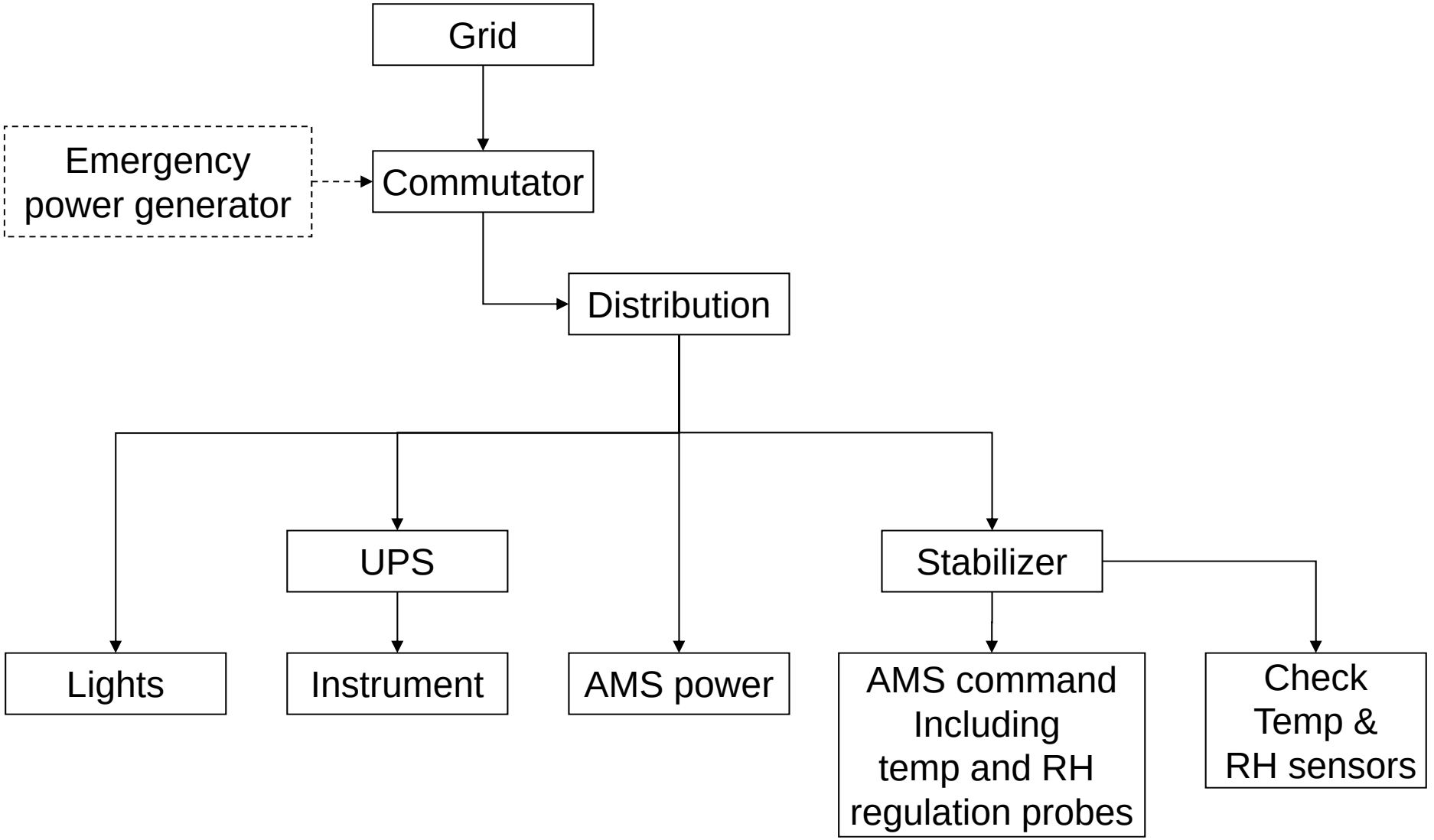
General organization
Organisation générale



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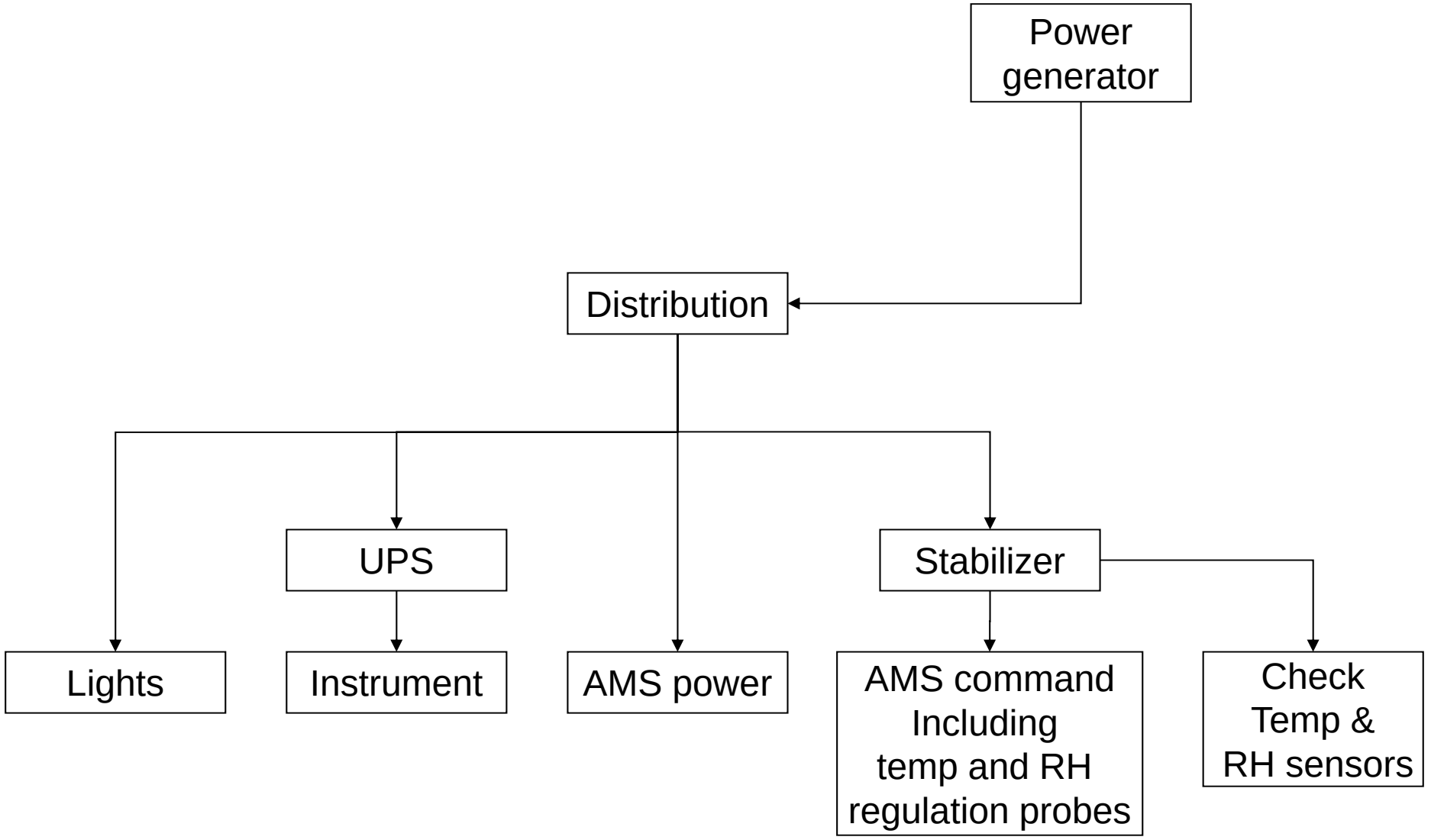

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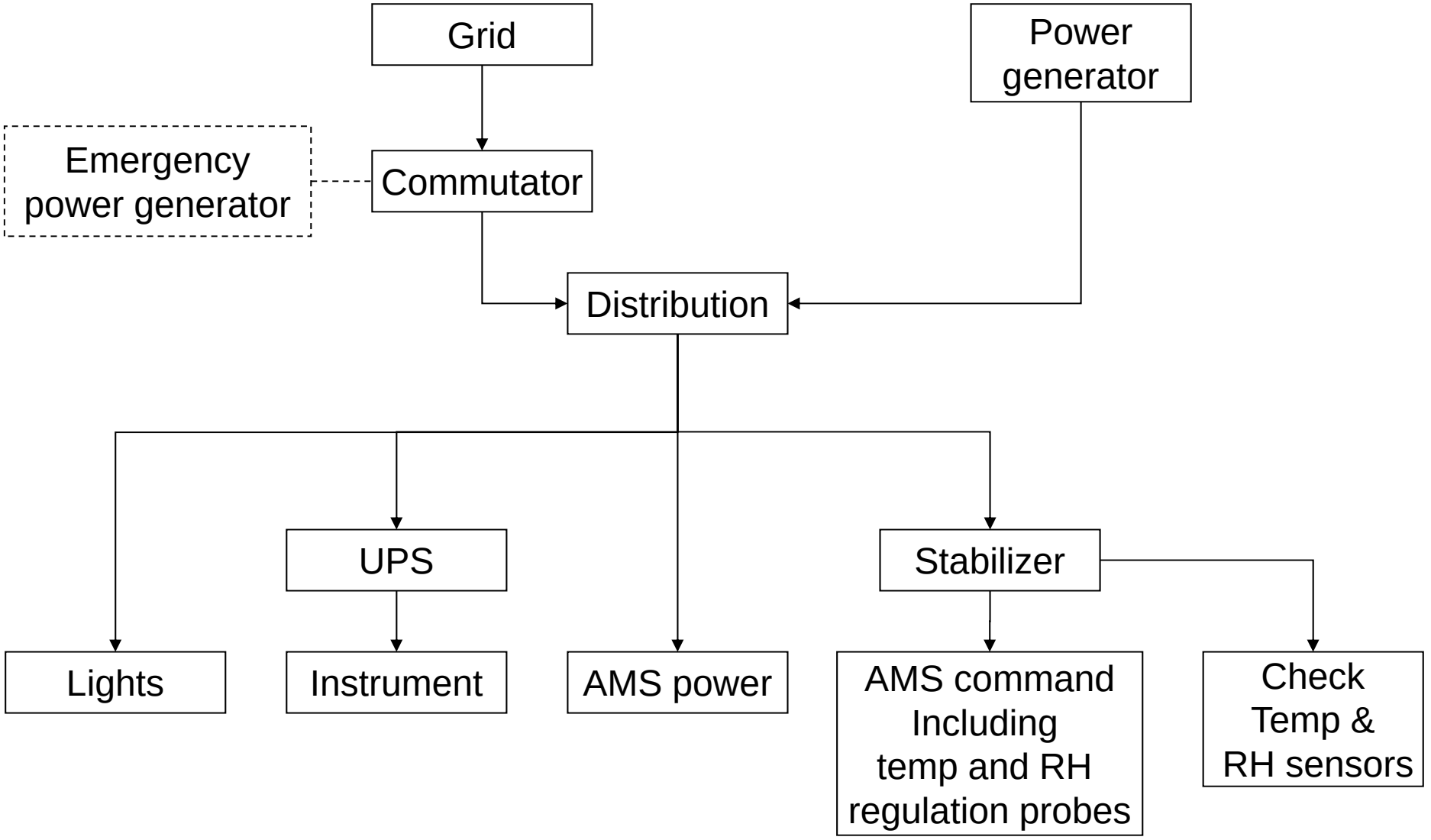

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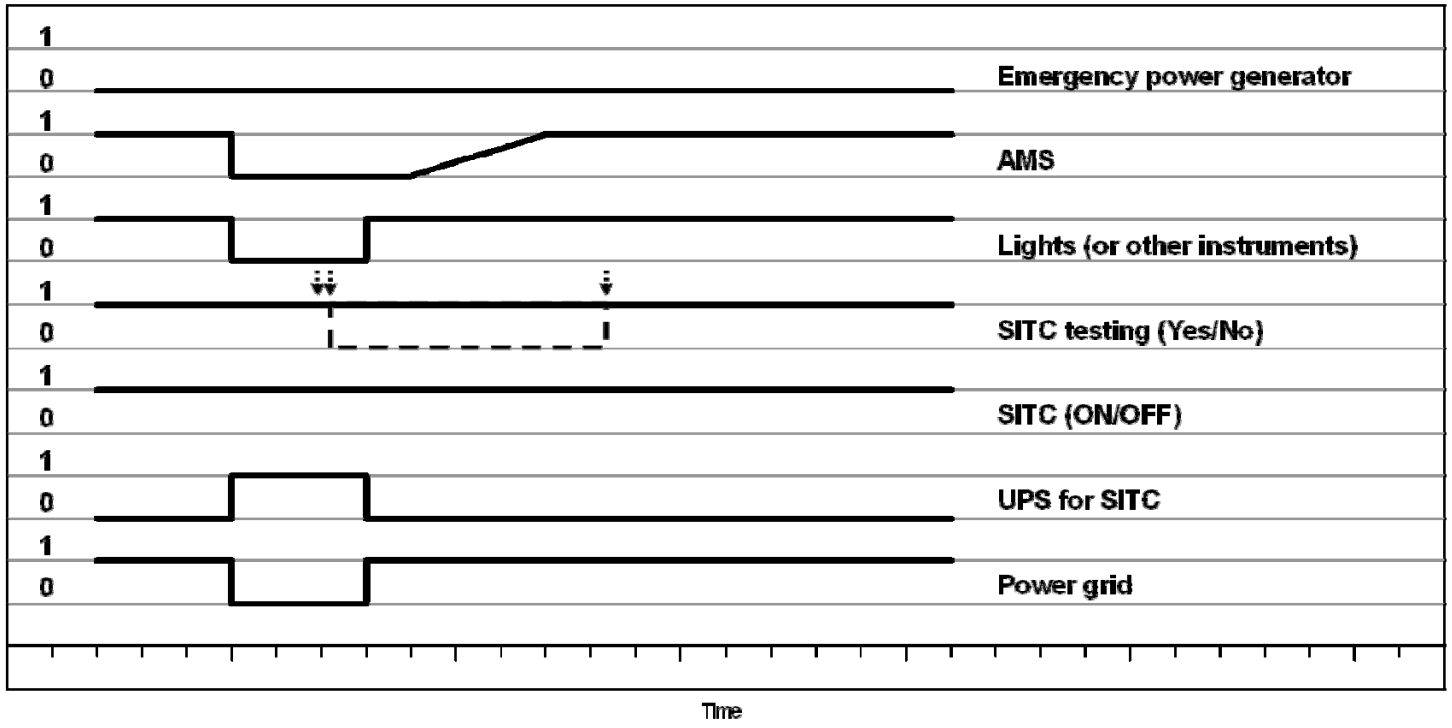
One example of sequence
Un exemple de séquence

UPS for partial system support

When power grid starts back before the emergency power generator

Power grid + emergency power generator



Operator's decision

The latest test data has to be checked / removed

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Un exemple de séquence

UPS for partial system support

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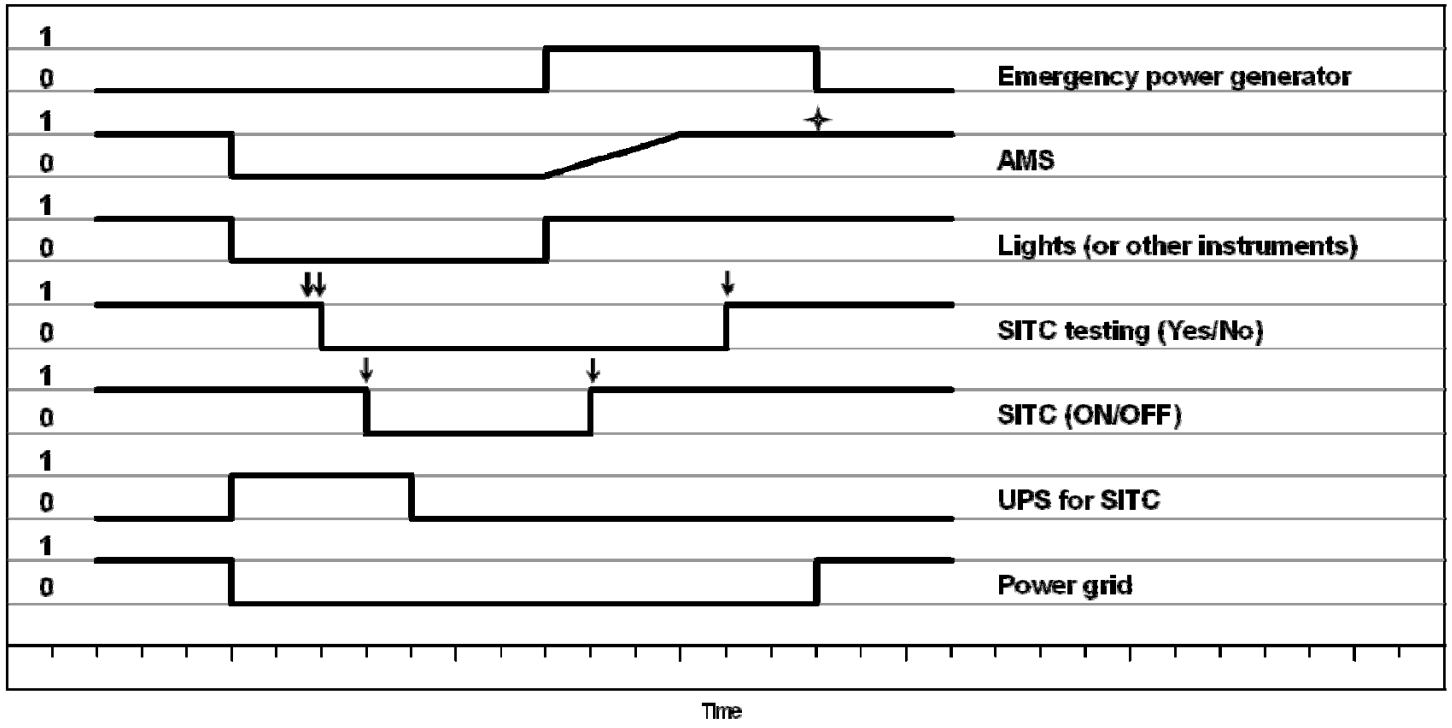

↓ Operator's decision

↓↓ The latest test data has to be checked / removed

✦ Possible power line disturbance

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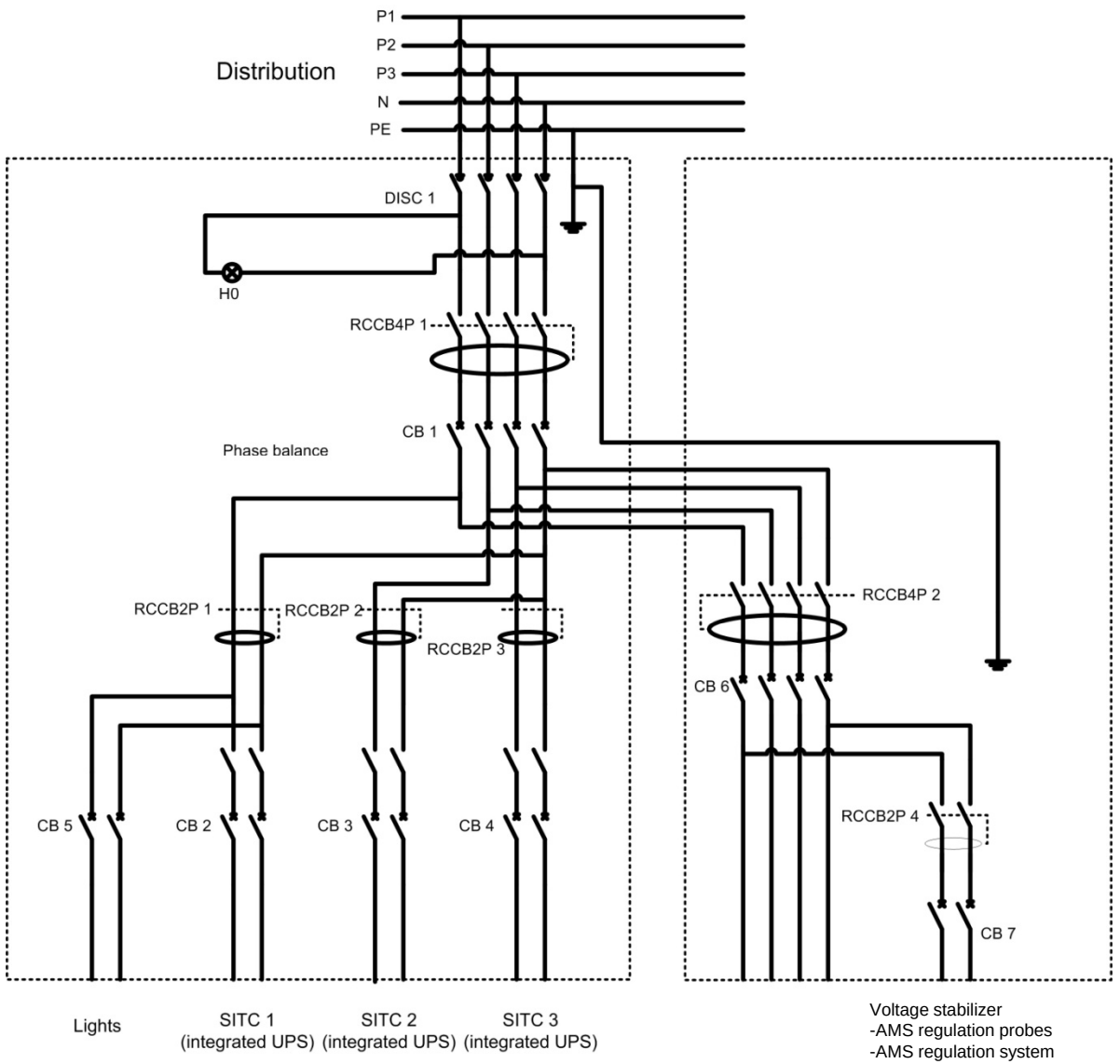
Recommended typical installation
Installation typique recommandée



Voltage stabilizer
-AMS regulation probes
-AMS regulation system
-AMS command
-Independent temp. and
R.H. measuring probes

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Sizing of the installation
Dimensionnement de l'installation

- Total electrical power of the whole laboratory
- Power of laboratory lighting
- SITC power
- Compressor
- AMS
- AMS control/command system, AMS regulation system, and AMS temperature and relative humidity probes
- Presence of the UPS in the system

- Puissance totale installée pour tout le laboratoire
- Eclairage
- Puissance des CMI
- Compresseur
- CTA
- Commande, régulation, capteurs de température et d'humiditié relative de la CTA
- Présence d'onduleur dans le circuit

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Conclusion
Conclusion

- Taking care of the electrical assembly is the best warranty that all the instruments will not suffer from any electrical chock
- Taking care on how the protection work together and how the measuring devices should be stopped / restarted could insure a longer life for them
- Calculating all protection elements is to be done by experts

- Prendre en compte le montage électrique est la meilleure garantie que les équipements ne subiront pas de chocs électriques
- Prendre en compte le fonctionnement des protections et les nécessités de mise en marche / arrêt permet d'allonger la vie des équipements
- Faire calculer toutes les protections par des experts

All details in:

Tous les détails dans :

GOURLOT J-P., GALLET P. and PAYET L., 2010, Rapport “Activity D.1.2.: Development of a list of requirements for an integrated power supply system for laboratories”, Project CFC/ICAC/33, 19 p.

Thanks for your attention

Some advises for insulating a new cotton testing laboratory

Quelques conseils techniques pour l'isolation d'un nouveau laboratoire d'analyse du coton

GOURLOT J.-P. PAYET L.

Arusha, January 2012

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Introduction

- Testing cotton fibres requires specific conditions
- Hygroscopicity of fibres
- Some conditions of proper realization of the measurements

- Tester des fibres de coton requière des conditions specifiques
- Hygroscopicité des fibres
- Quelques conditions de bonnes réalisation des mesures

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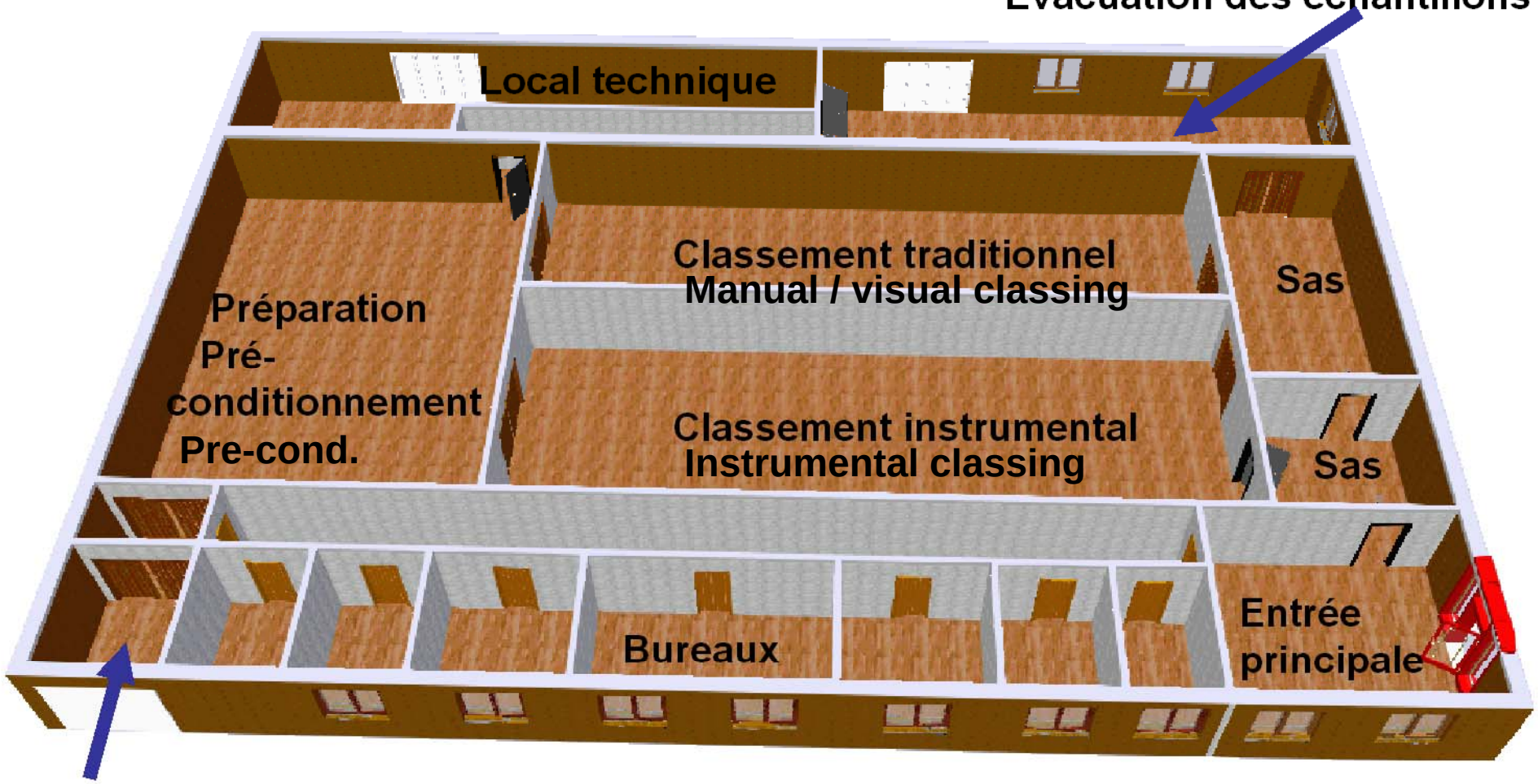
Position of the laboratory
Position du laboratoire



Avant du bâtiment
Front of the building

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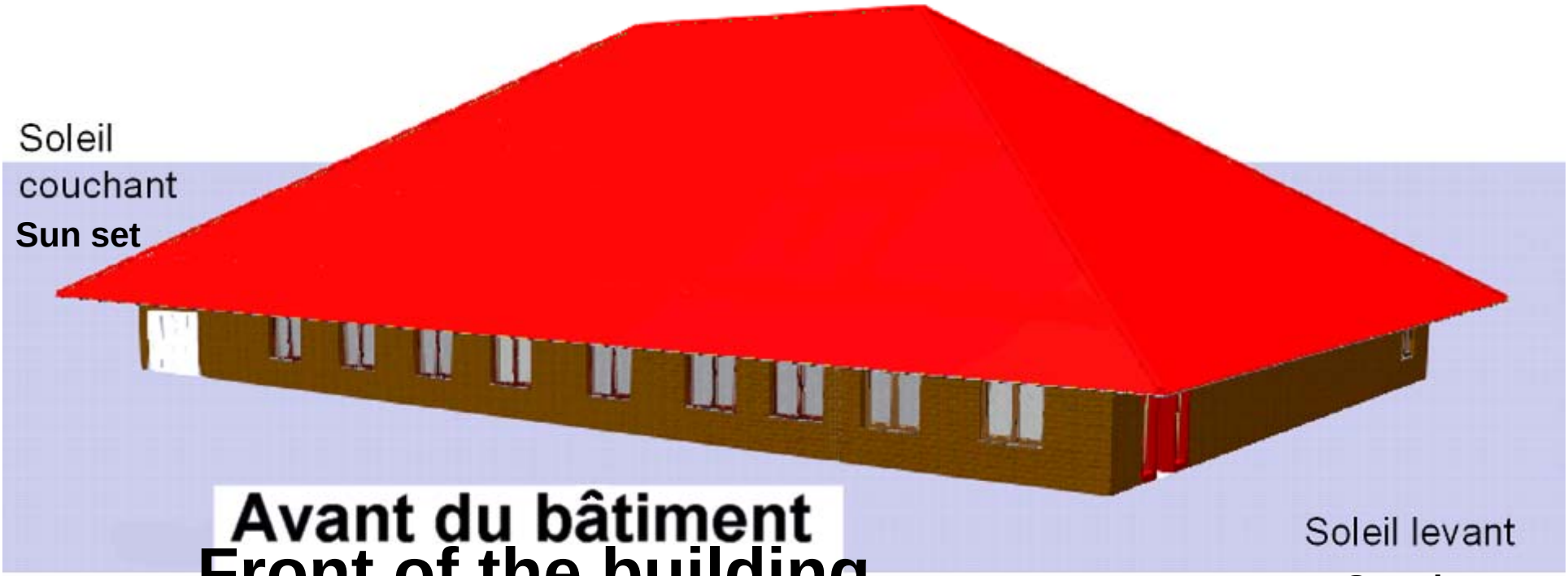
External shape of the building
Forme extérieure du bâtiment



Le toit déborde des murs pour les isoler d'une insulation directe

The roof is larger than the building to avoid its direct insulation

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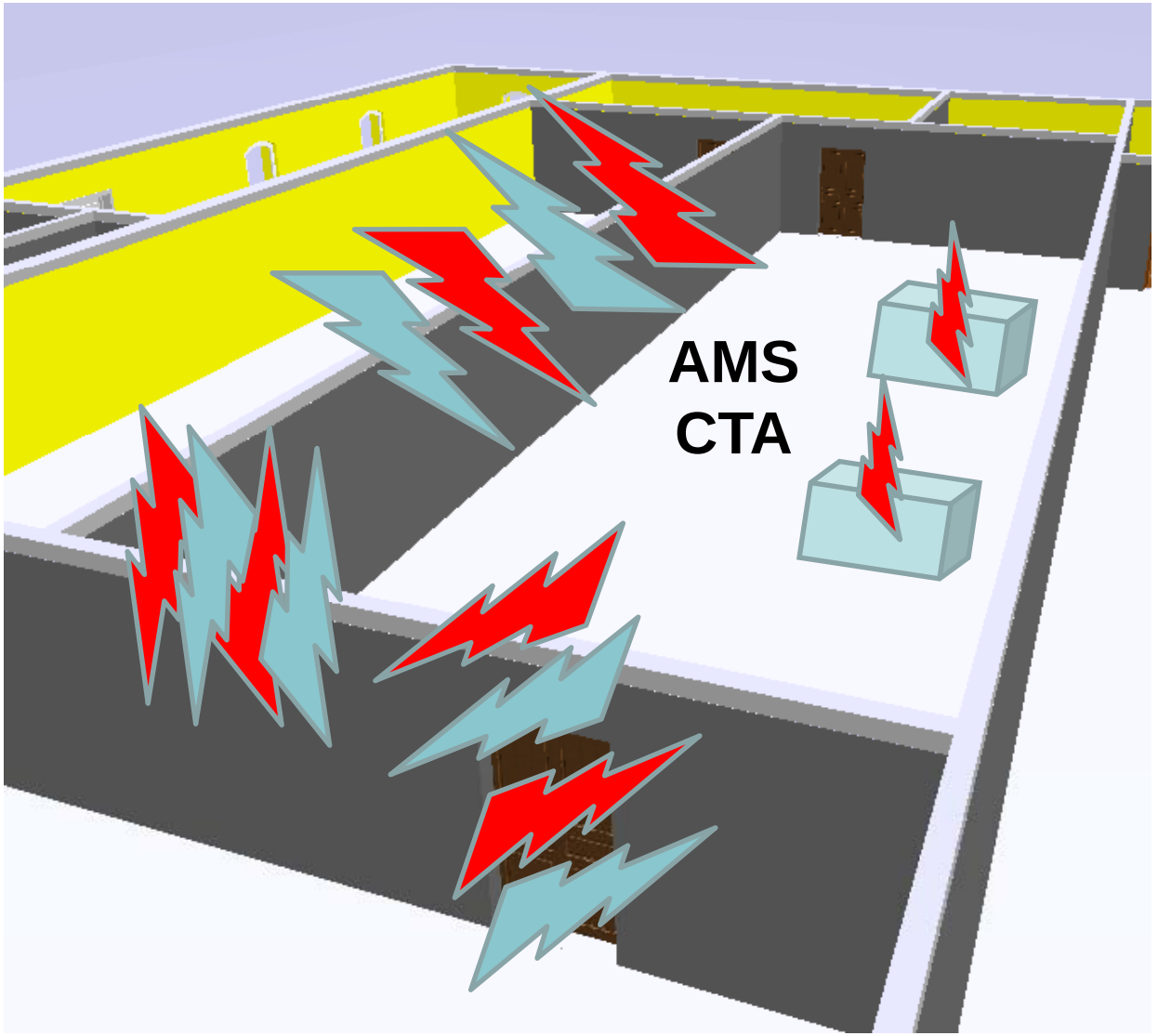
Heat and vapor transferts
Transferts de chaleur et d'eau



Water transfert
Transfert d'eau

Heat transfert
Transfert de chaleur

AMS: Air Management System
CTA : Centrale de Traitement d'Air

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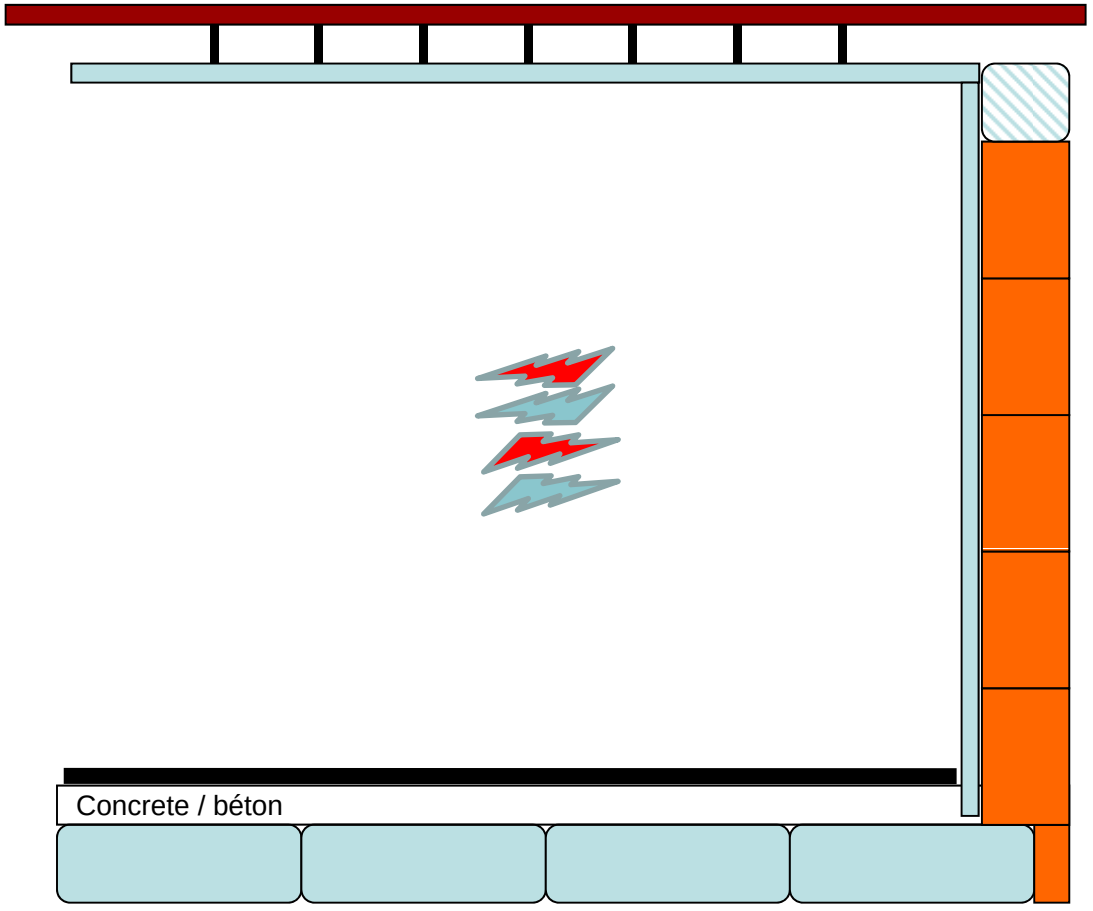
Heat and vapor transferts
Transferts de chaleur et d'eau



Water transfert
Transfert d'eau

Heat transfert
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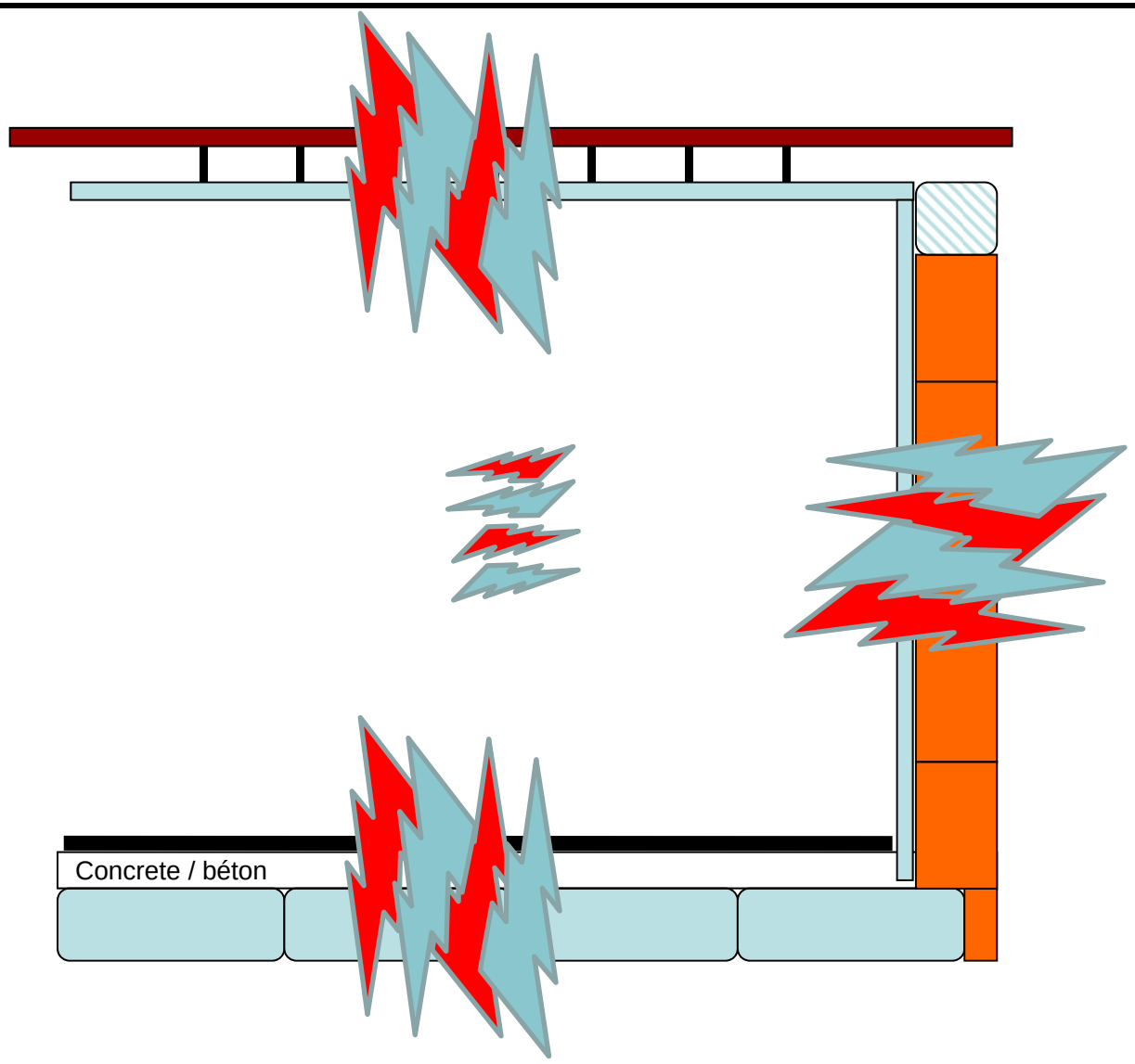
Heat and vapor transferts
Transferts de chaleur et d'eau



Water transfert
Transfert d'eau

Heat transfert
Transfert de chaleur

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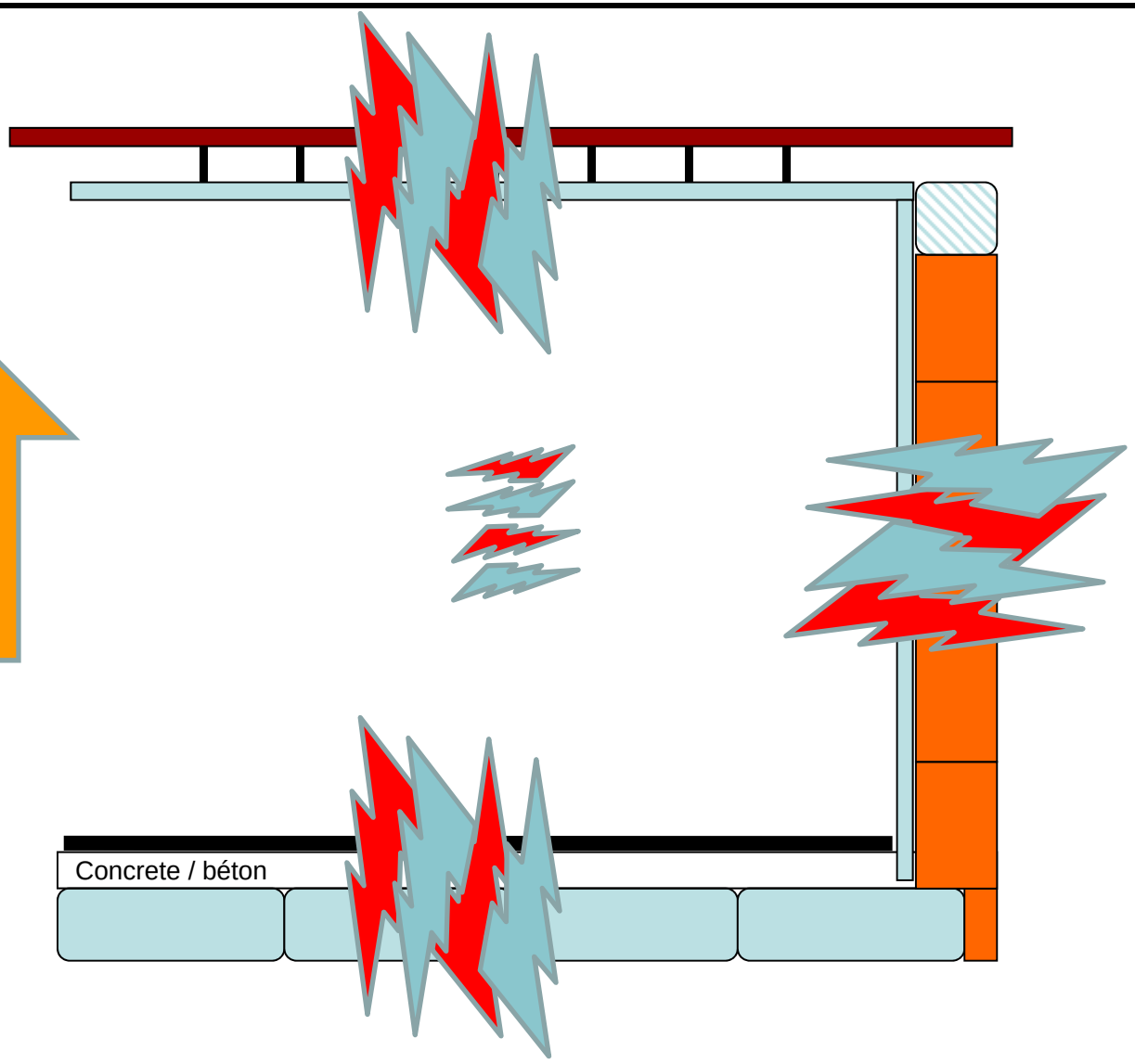
Heat and vapor transferts
Transferts de chaleur et d'eau

Porosity
Porosité

Energy for controlling

Energie de maintien



Water transfert
Transfert d'eau

Heat transfert
Transfert de chaleur

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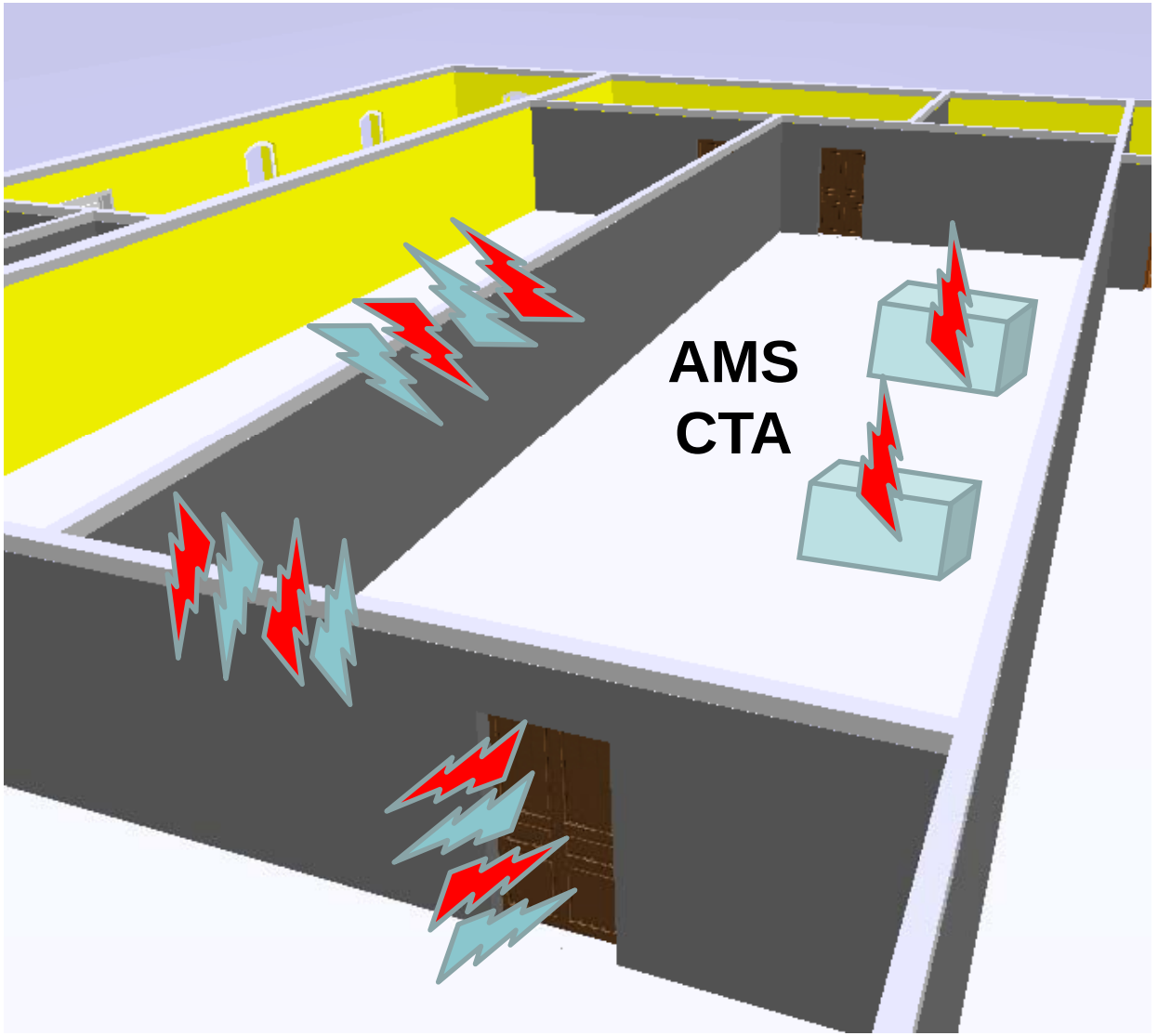
Heat and vapor transferts
Transferts de chaleur et d'eau

Minimize !!!
Minimiser !!!



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Transfert d'eau

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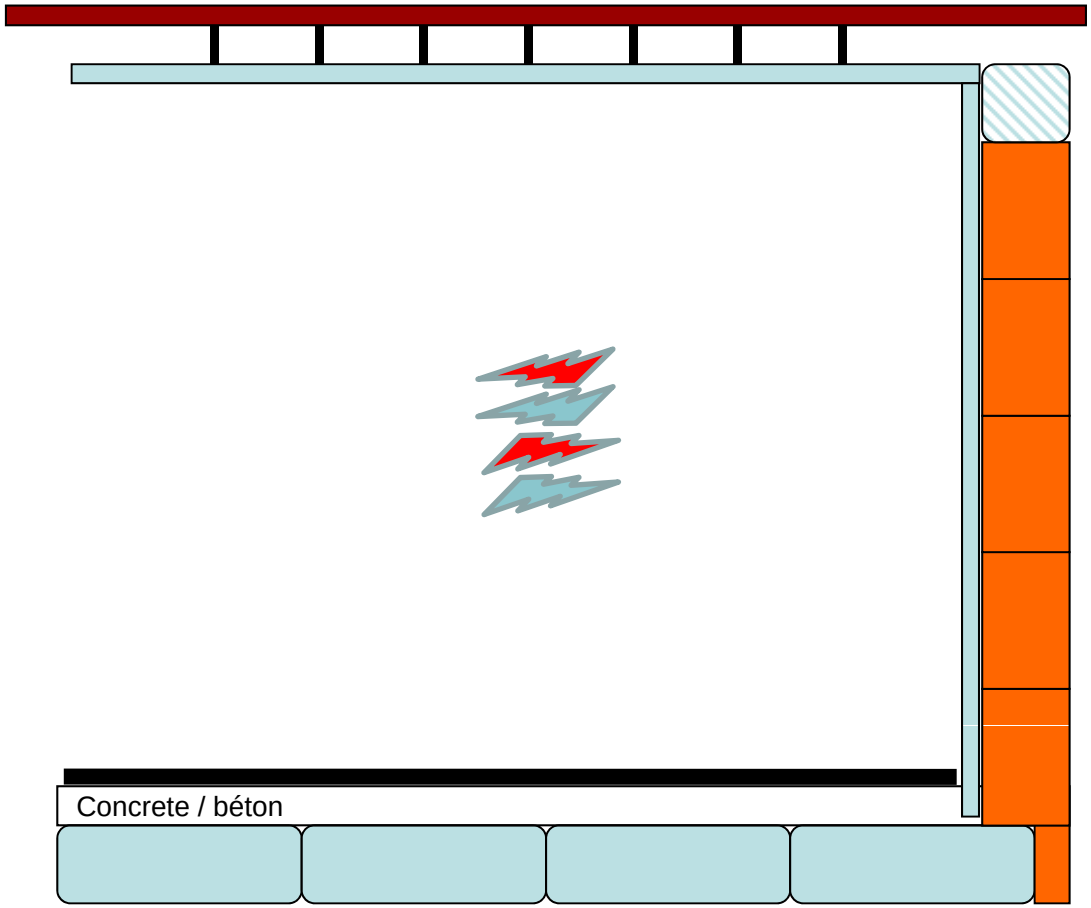
Heat and vapor transferts
Transferts de chaleur et d'eau



Water transfert
Transfert d'eau

Heat transfert
Transfert de chaleur

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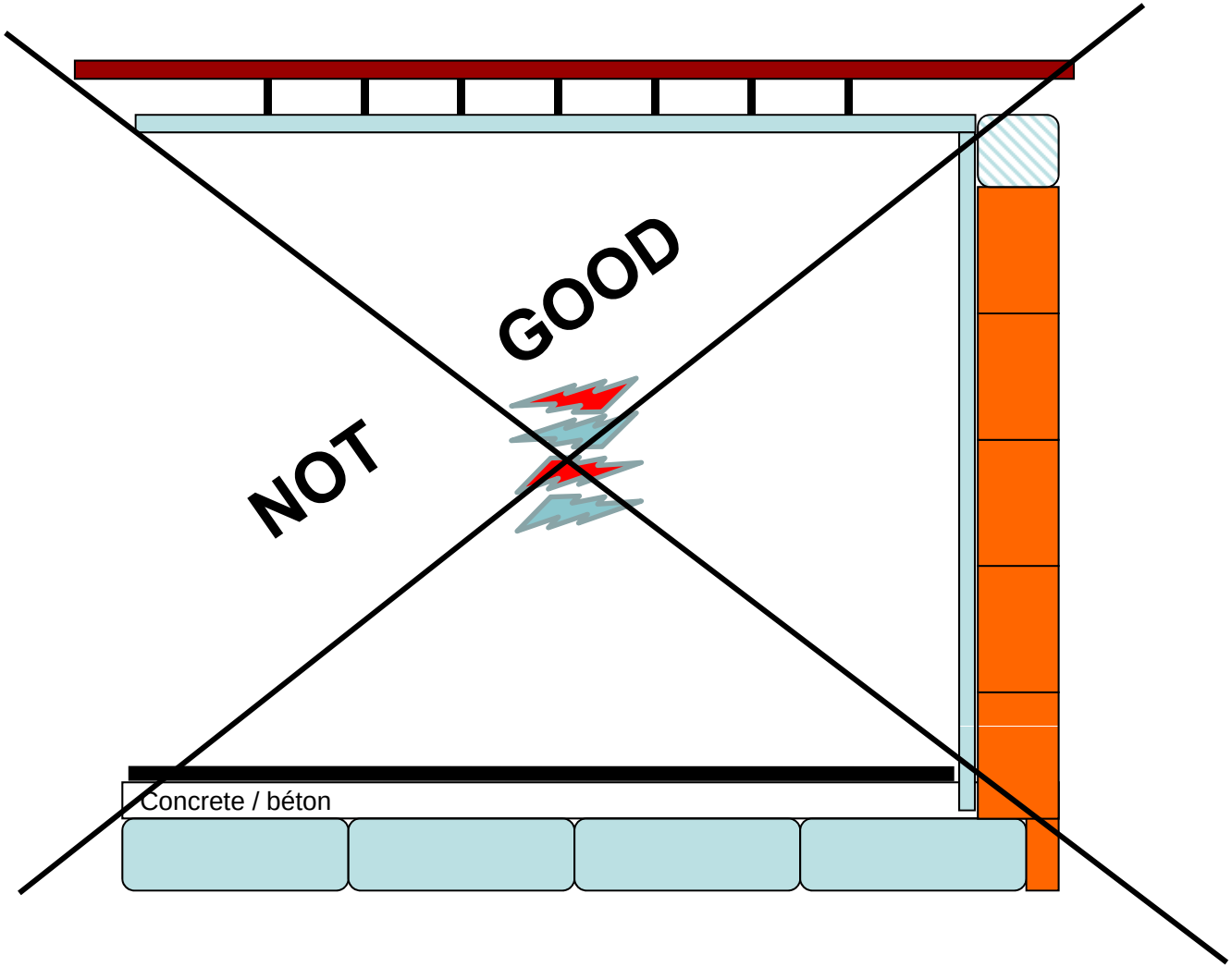
Heat and vapor transferts
Transferts de chaleur et d'eau



Water transfert
Transfert d'eau

Heat transfert
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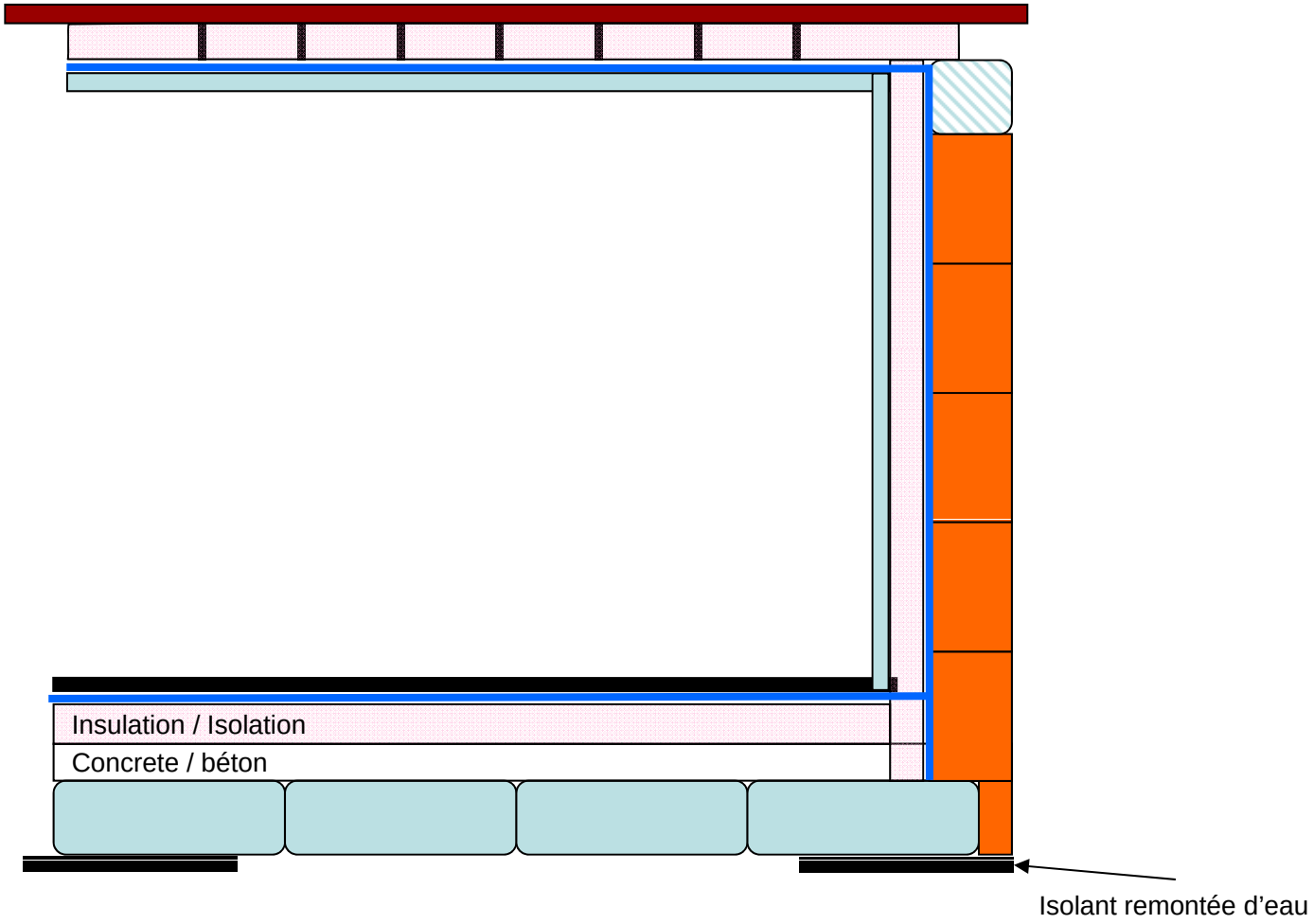
Avoid heat and vapor transferts
Eviter les transferts de chaleur et d'eau



Water transfert
Transfert d'eau

Heat transfert
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Avoid heat and vapor transferts
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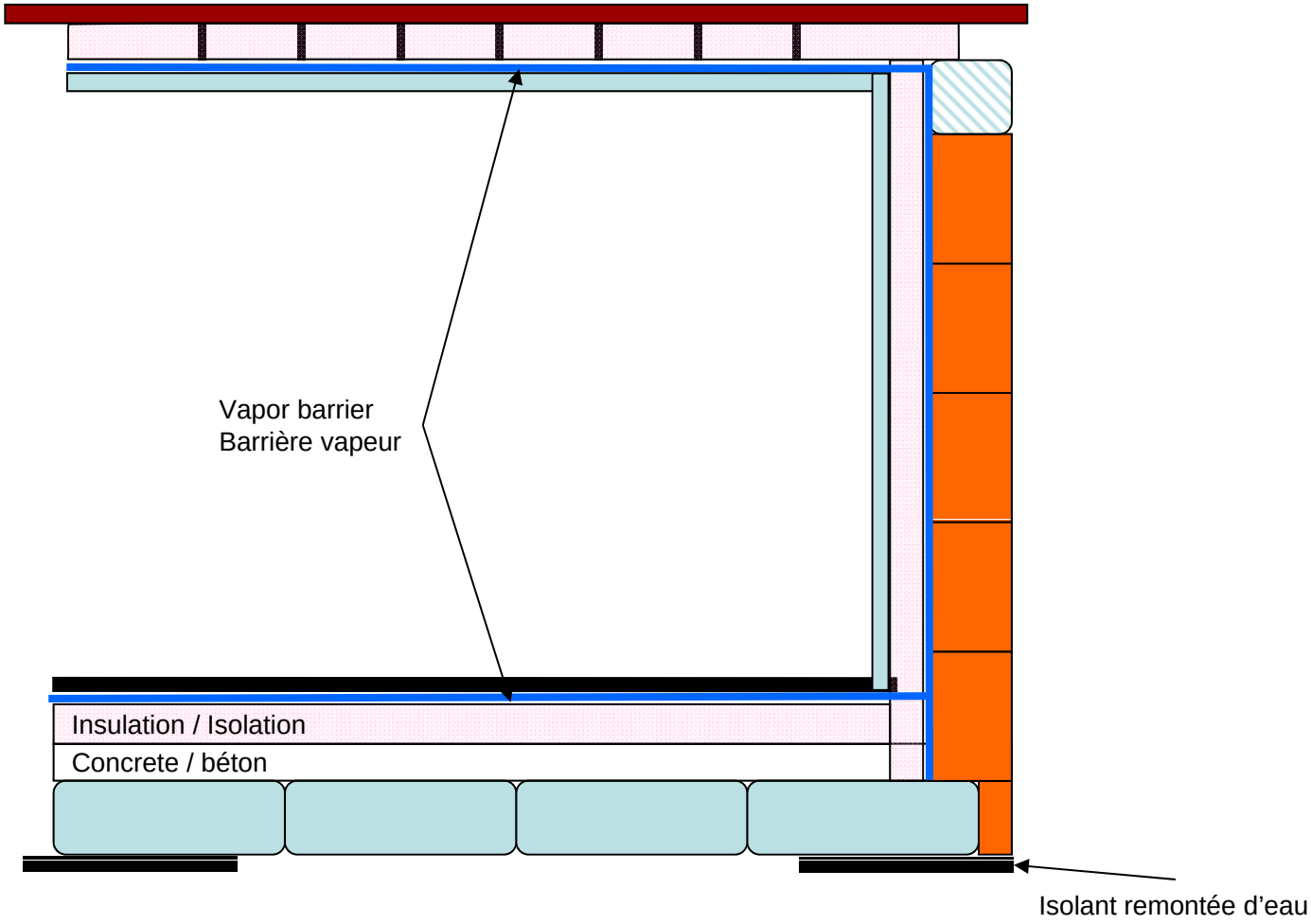

Water transfert
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Heat transfert
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Avoid heat and vapor transferts
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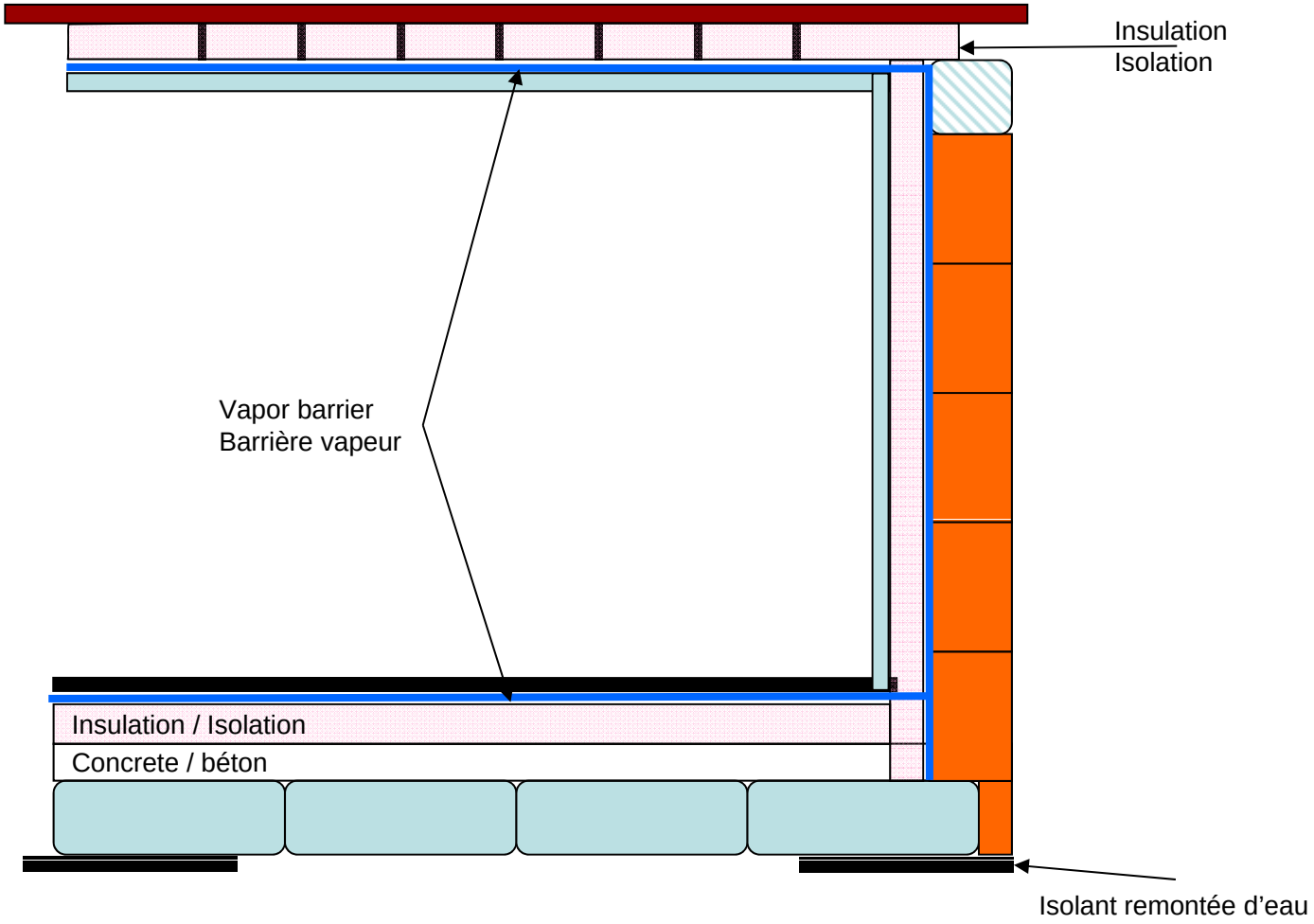

Water transfert
Transfert d'eau

Heat transfert
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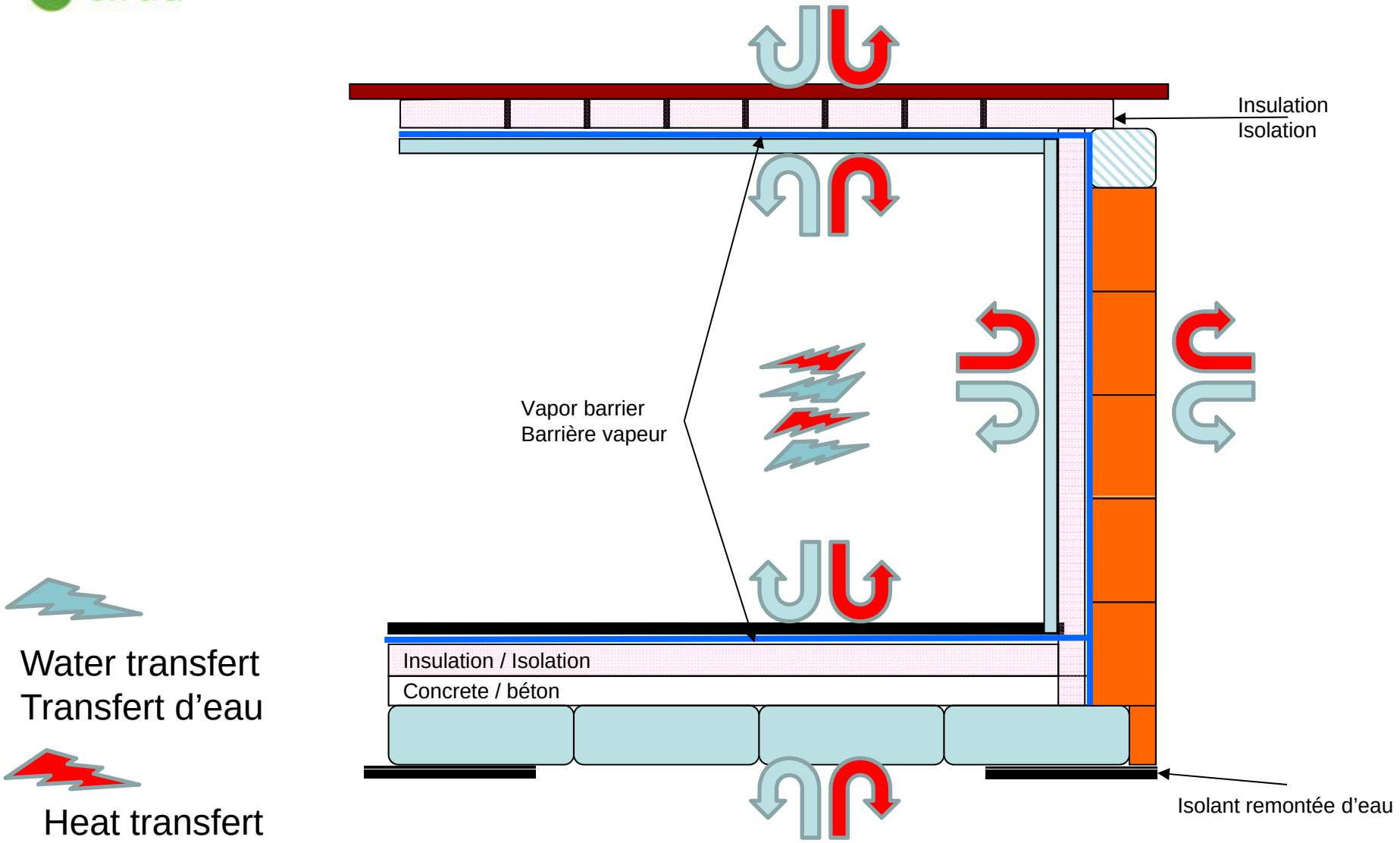

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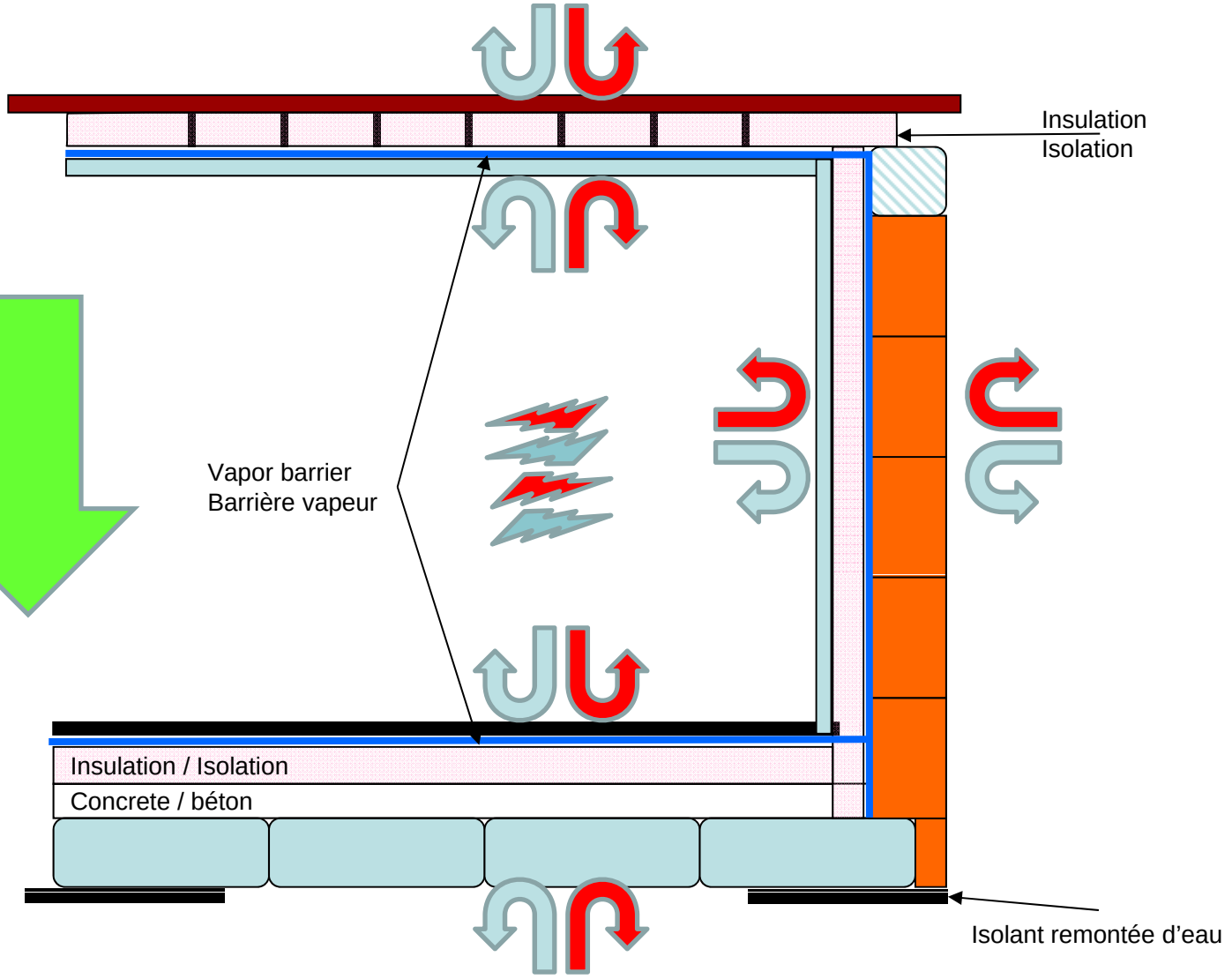
Avoid heat and vapor transferts
Eviter les transferts de chaleur et d'eau

~~Porosity~~
~~Porosité~~

Energy for controlling

Energie de maintien



Water transfert
Transfert d'eau

Heat transfert
Transfert de chaleur

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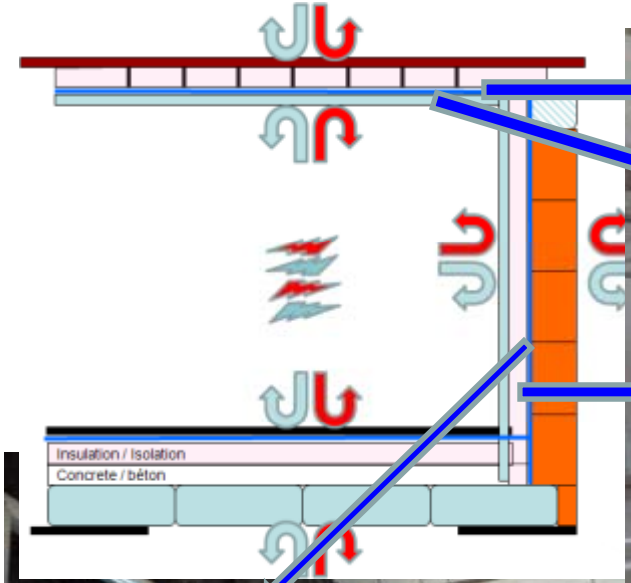
Example of insulation
Exemple d'isolation



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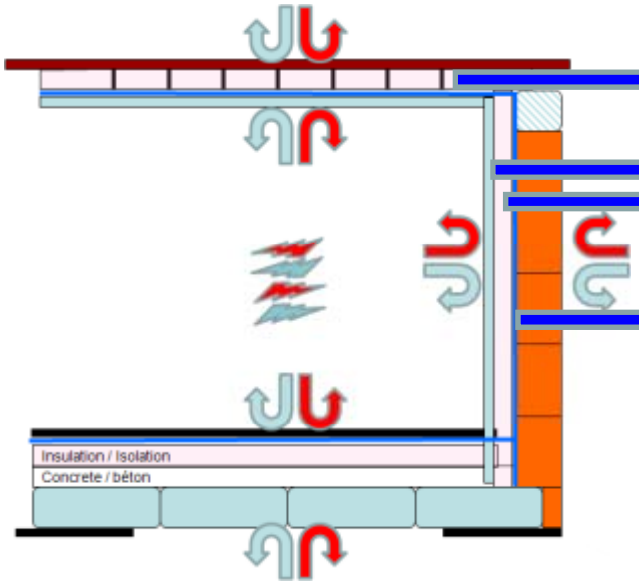
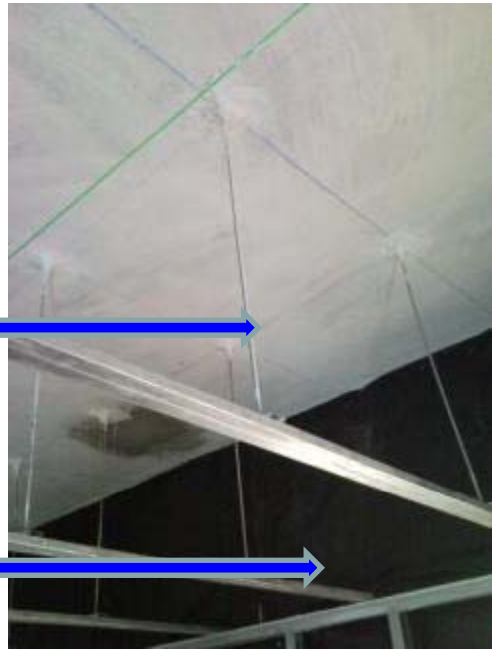
Exemple d'isolation





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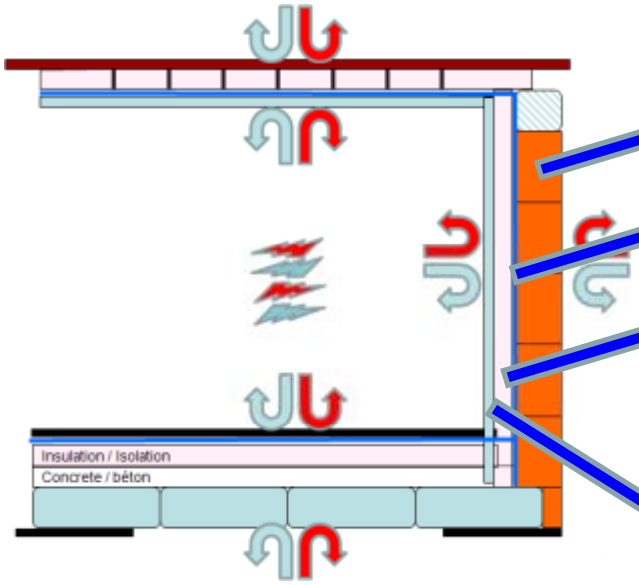
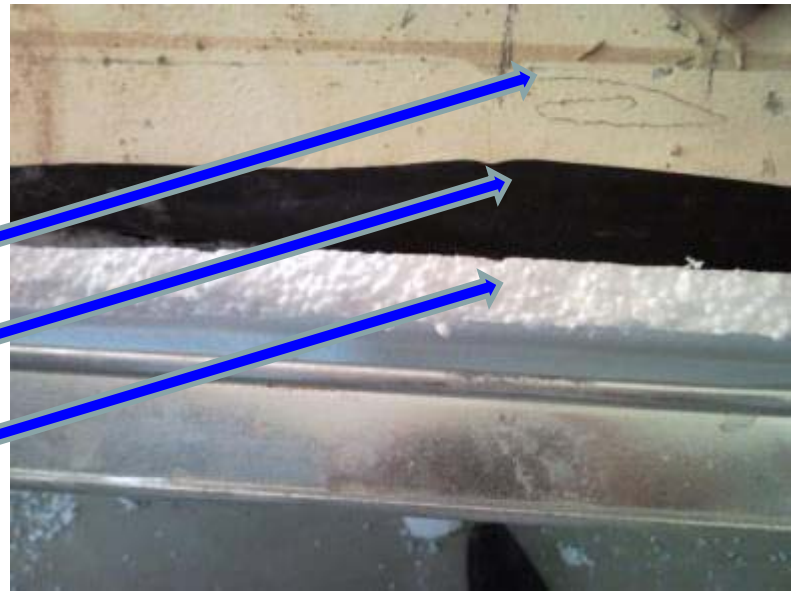
Example of insulation
Exemple d'isolation





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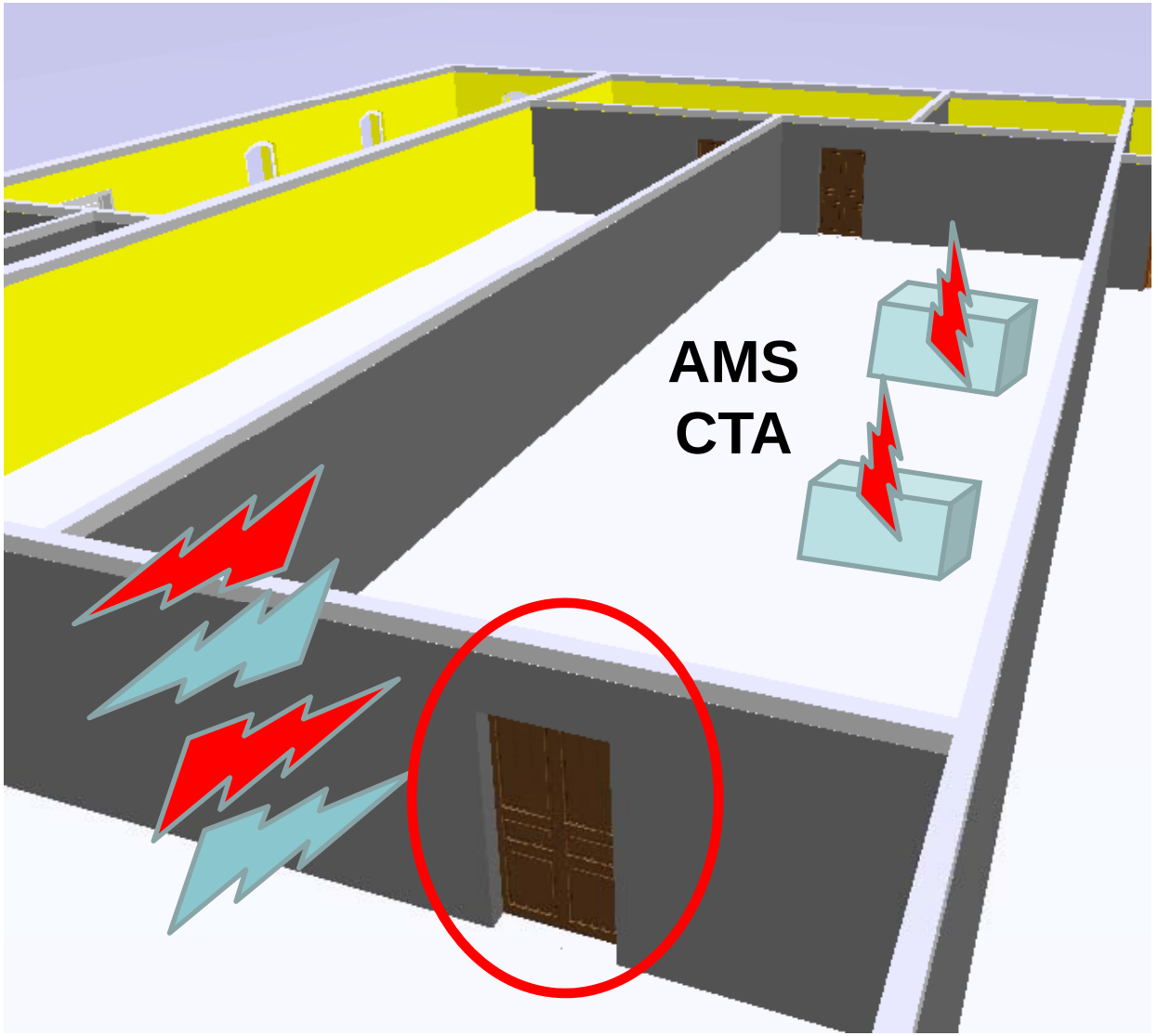
Heat and vapor transferts
Transferts de chaleur et d'eau



Water transfert
Transfert d'eau

Heat transfert
Transfert de chaleur

AMS: Air Management System
CTA : Centrale de Traitement d'Air

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Example of insulation
Exemple d'isolation

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Conclusion
Conclusion

Insulate the laboratory

- Decreases AMS investment costs
- Decreases running costs
- Ease the regulation of the ambient conditions
- Ensure better testing conditions
- Results more stable

Isoler le laboratoire

- Diminue les coûts d'investissements pour CTA
- Diminue les coûts de fonctionnement
- Facilite la régulation des conditions d'ambiance
- Meilleures conditions de tests
- Résultats plus stables

All details in:

Tous les détails dans :

Executive summaries (under preparation),
Project CFC/ICAC/33

Thanks for your attention

Activity D.1.3.
Development of a list of requirements and basic principle drawings for a simple and efficient integrated climate control system

Développement d'une liste de pré-requis et de principes de base pour une centrale intégrée de traitement d'air simple et efficace

GOURLOT J.-P.

Arusha, January 2012

From a joint work by:
A partir d'un travail conjoint de :
Payet and Gourlot

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Plan of presentation

Cotton Testing in Africa
CSITC - Project

1 - Introduction

2 - Description of the technical objective

3 - Ambient Air Management System Requirements

4 - Method for controlling the AMS equipment

5 - Conclusion

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Plan of presentation

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1- Introduction

- From expertise tours in laboratories: basic standards required for cotton testing sometimes not completely respected
- System very complex
- Manufacturer could miss some technical information about how to regulate both temperature (T) and relative humidity (RH) of the air in approved tolerances
- Provide to laboratories a full description of the system

- Selon les expertises réalisées en laboratoires : certains critères de base nécessaires au test du coton ne sont pas toujours respectés
- Système très complexe
- Le fournisseur peut omettre certaines informations techniques concernant la régulation simultanée de la température (T) et de l'humidité relative (HR) de l'air dans les tolérances normales
- Fournir aux laboratoires un descriptif détaillé du système

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Plan of presentation

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2- Description of the technical objective

- Recognition of the classing laboratories using SITC at the international level in terms of air management
- List of technical requirements and recommendations:
  - standards dealing with textiles testing
  - additional experiments to check that every requirement is effectively fulfilled for installing, improving or controlling the equipment
- With this knowledge, laboratories should be able to prove their capacity for maintaining their climate control system within the worldwide agreed tolerances

- Reconnaissance internationale en termes de gestion de l'air des laboratoires de classement utilisant des CMI
- Liste des critères techniques et recommandations :
  - normes relatives aux essais sur textiles
  - expériences complémentaires de vérification lors de l'installation, l'amélioration ou le contrôle des équipements
- Avec ces connaissances, les laboratoires seront en mesure de prouver leur capacité à maintenir leurs conditions dans les tolérances exigées au niveau mondial

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Plan of presentation

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3.1- Reasons for working in standard conditions

- Cotton is hygroscopic
- Moisture content (MC) depends on Relative Humidity (RH)
- *RH change 8-10% → MC change 1%*
- Influence on cotton properties (maturity, length, strength)
- *RH change 3-5% → Strength change 1 cN/tex (Sasser, 1990)*

- Propriété hygroscopique du coton
- Le taux de reprise (TRL) dépend de l'Humidité Relative (HR)
- *HR change 8-10% → TRL change*
- Influence sur certaines propriétés du coton (maturité, longueur, ténacité)
- *HR change 3-5% → ténacité change 1 cN/tex (Sasser, 1990)*

Moisture %	Length mm	Strength grams/ tex
6.5%	24.02	22.53
7.5%	24.49	24.50
8.5%	24.95	26.87
9.5%	25.42	28.44

Moisture %	Length mm	Strength grams/tex
6.5%	32.42	34.76
7.5%	33.05	37.80
8.5%	33.67	40.84
9.5%	34.30	43.88

USTER, Influence of moisture content on UHML and Str of Short-Weak (left) and Long-Strong (right) cottons

→ Bring cotton to EMC so that UHML and Str variations and levels can be comparable intra- and inter-laboratories

→ Amener le coton à l'équilibre hygroscopique pour éviter les variations d'écart/de niveau (UHML, Str) en intra- et inter-laboratoire

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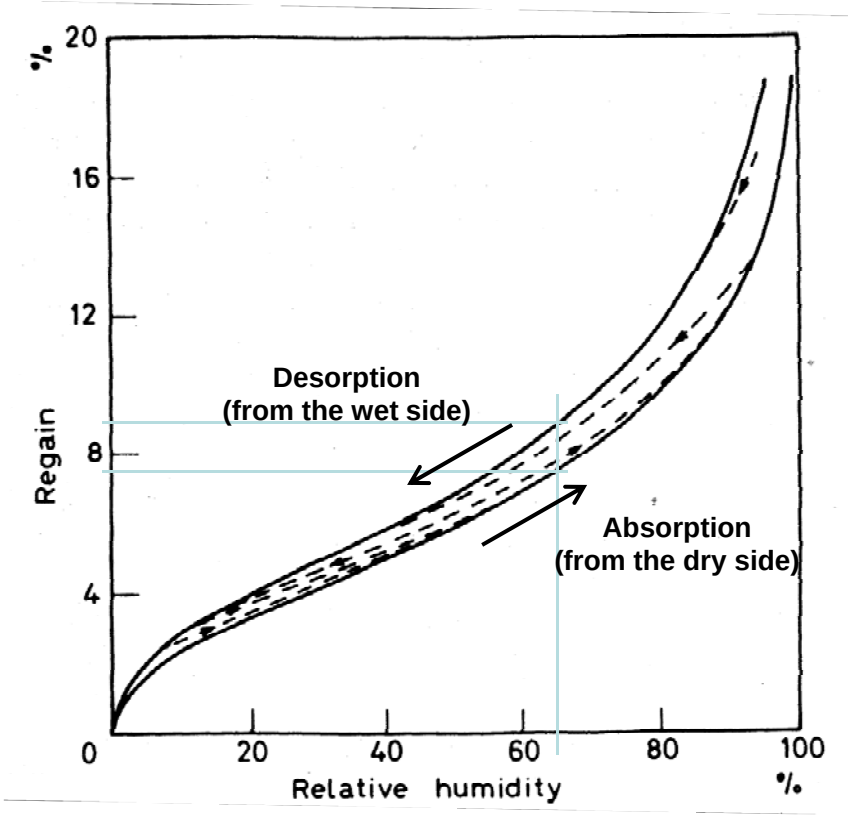
3.1- Reasons for working in standard conditions

- Equilibrium moisture content (dry basis): 6.75 - 8.25%
- Sample conditioning in approved atmospheric conditions
- Recommendation: start the conditioning from the dry

- Equilibre hygroscopique (taux de reprise) : 6.75 - 8.25%
- Conditions atmosphériques normalisées
- Recommandation: conditionner à partir de la masse sèche



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3.2- Standard requirements and tolerances

TEMPERATURE

Standard	Value	Tolerance	Resolution	Uncertainty
ISO 139:2005	20.0°C	± 2.0 °C	0.1 °C or better	± 0.5 °C or better
ISO 139:2005 alternative	23.0°C			
ASTM D 1776-08	70°F (21°C)	± 2°F (1°C)	N/A	N/A

RELATIVE HUMIDITY

Standard	Value	Tolerance	Resolution	Uncertainty
ISO 139:2005	65 %	± 4 %	0.1 % or better	± 2.0 % or better
ISO 139:2005 alternative	50 %			
ASTM D 1776-08	65 %	± 2 %	N/A	N/A

Resolution (of displaying device)
smallest difference between indications of displaying that can be meaningfully distinguished

Résolution (instrument)
La plus petite différence d´indication d´un dispositif afficheur qui peut être perçue de manière significative

Uncertainty of measurement
parameter, associated with the result of measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand

Incertitude (mesure)
Paramètre, associé au résultat d'un mesurage, qui caractérise la dispersion des valeurs qui pourraient raisonnablement être attribuées au mesurande

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3.2- Standard requirements and tolerances

TEMPERATURE

Standard	Value	Tolerance	Resolution	Uncertainty
ISO 139:2005	20.0°C	± 2.0 °C	0.1 °C or better	± 0.5 °C or better
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ASTM D 1776-08	70°F (21°C)	± 2°F (1°C)	N/A	N/A

ISO 139 **21 ± 1°C**

ASTM D 1776 **65 ± 2 %**

RELATIVE HUMIDITY

Standard	Value	Tolerance	Resolution	Uncertainty
ISO 139:2005	65 %	± 4 %	0.1 % or better	± 2.0 % or better
ISO 139:2005 alternative	50 %			
ASTM D 1776-08	65 %	± 2 %	N/A	N/A

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3.2- Standard requirements and tolerances

TEMPERATURE

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ASTM D 1776-08	70°F (21°C)	± 2°F (1°C)	N/A	N/A

ISO 139
ASTM D 1776

21 ± 1°C
65 ± 2 %

Recommandation

± 0.5°C

RELATIVE HUMIDITY

Standard	Value	Tolerance	Resolution	Uncertainty
ISO 139:2005	65 %	± 4 %	0.1 % or better	± 2.0 % or better
ISO 139:2005 alternative	50 %			
ASTM D 1776-08	65 %	± 2 %	N/A	N/A

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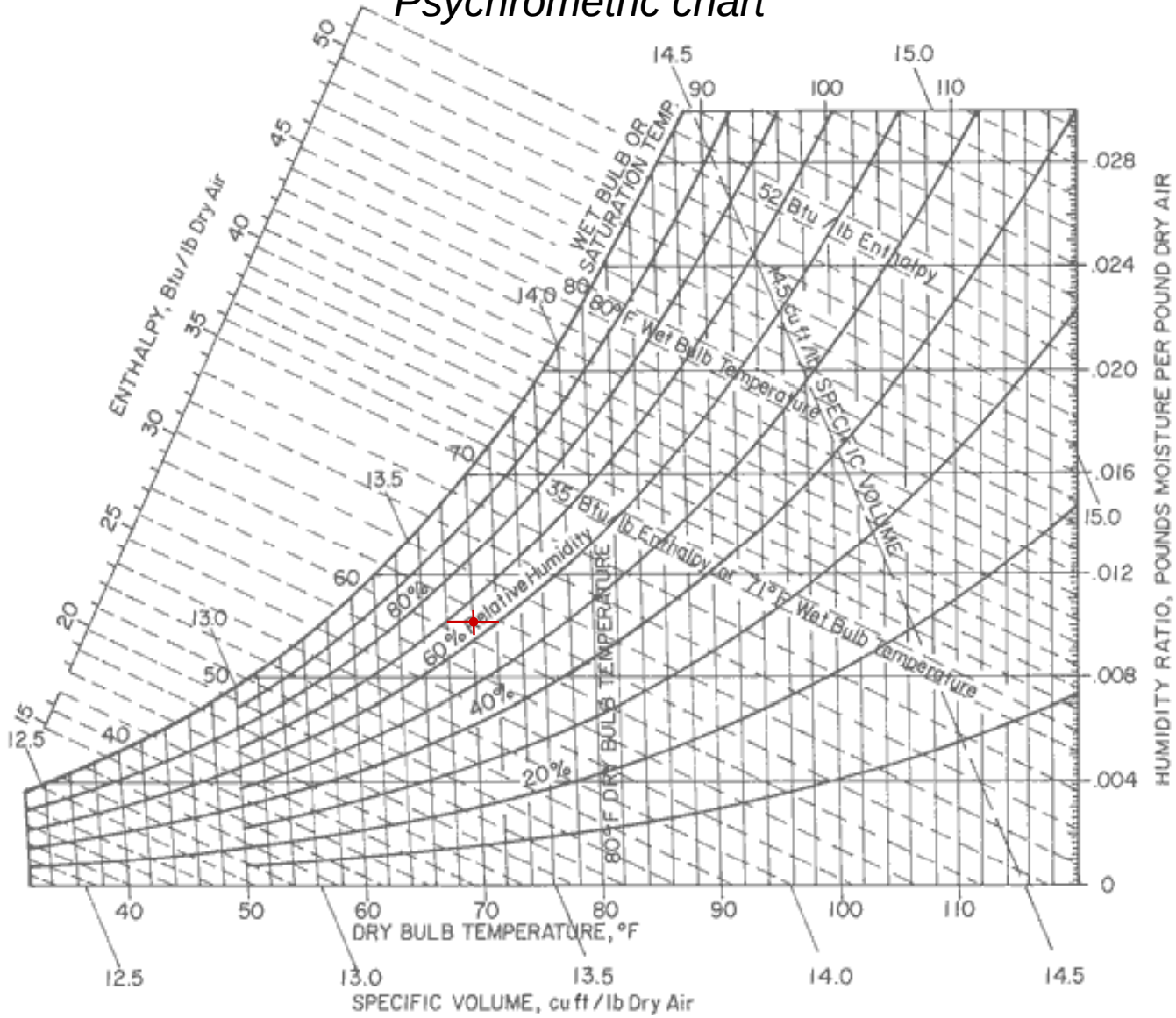
3.2- Standard requirements and tolerances

Psychrometric chart



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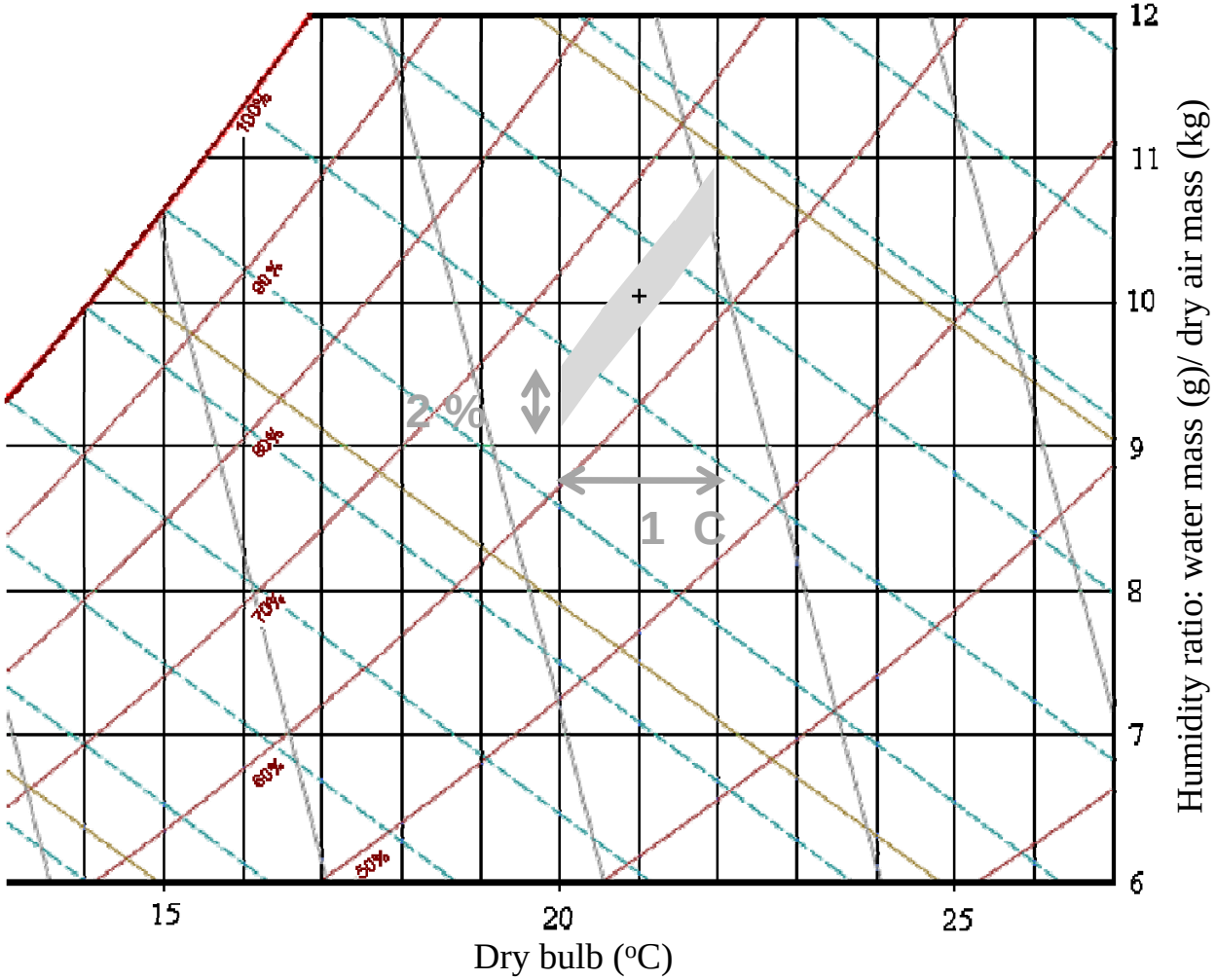
3.2- Standard requirements and tolerances

Psychrometric chart



\+ Point at 21°C and 65%

ASTM D1776 tolerance zone

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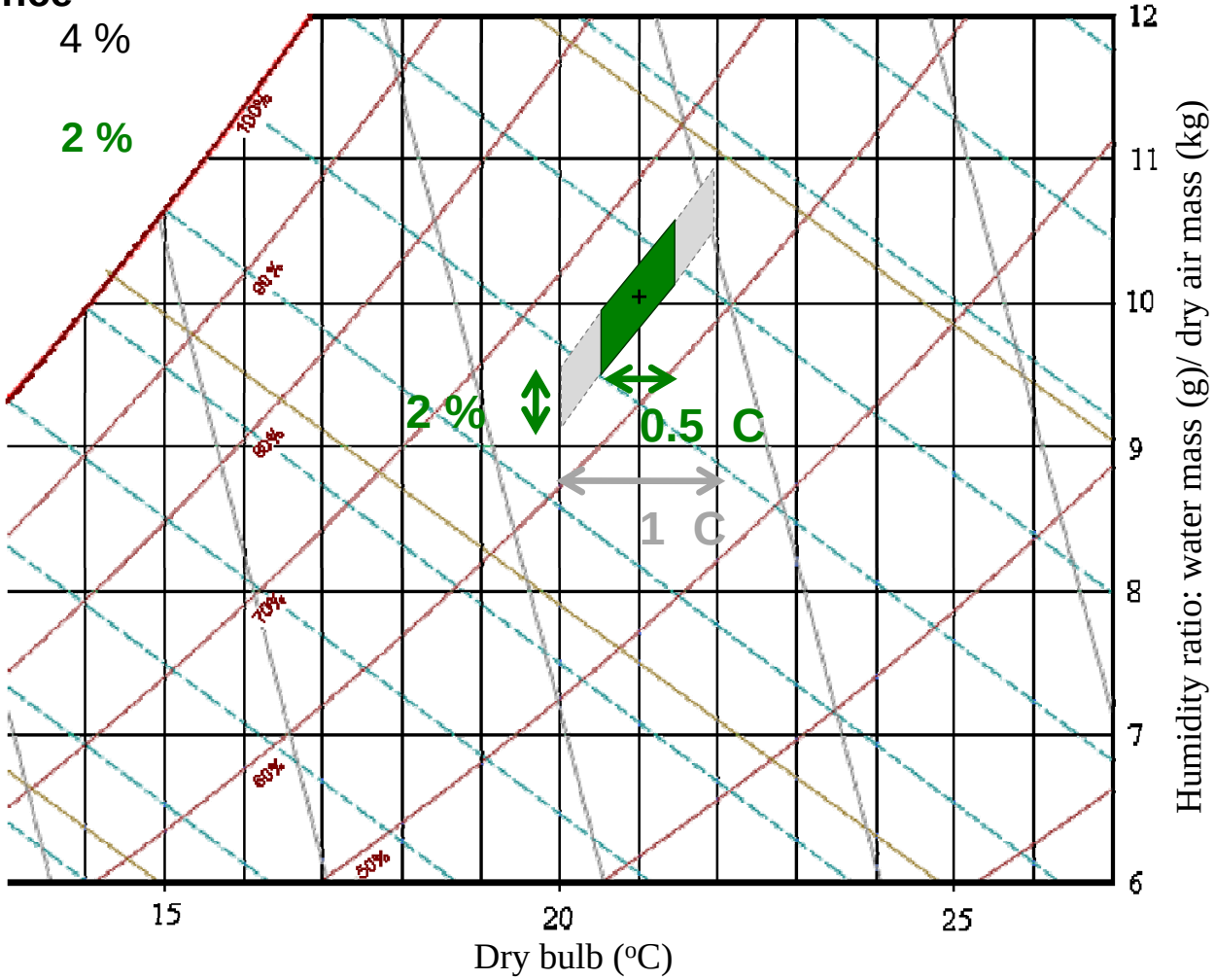
3.2- Standard requirements and tolerances

Equivalence

1 C ↔ 4 %

0.5 C ← 2 %

Psychrometric chart



\+ Point at 21°C and 65%

ASTM D1776 tolerance zone

Restricted tolerance zone

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3.3- Laboratory specifications

3.3.1- General specification

List of elements for calculating calorific power and heat balance, for properly localizing the return air ducts:

- Dimensions, area and volume of the room,
- Insulation, sunshine, temperature on each wall/glass, roof information,
- Laboratory equipment, lighting and other equipment, number of people in the room, number of entrances and airlocks
- …

Liste d'éléments nécessaires au calcul de la puissance calorifique et l'équilibre thermique, afin de placer correctement les bouches d'air :

- Dimensions, surface et volume de la salle,
- Isolation, ensoleillement, température sur chaque mur/fenêtre, information sur les toits,
- Equipement de laboratoire, éclairage et tout autre équipement, nombre de personnes dans la salle, nombre d'entrées et de sas
- …

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3.3- Laboratory specifications

3.3.2- Influence of insulation

- Energy saving
- Air conditions stabilising. Help abiding with the standardised atmospheres for conditioning and testing textiles
- Air conditioning system will be efficient only when specific requirements are fulfilled:
  - The laboratory has to be in the middle of the building, surrounded by corridors or office rooms so that external conditions could not affect the laboratory's. Failing this, the roof should be larger than the building to avoid its direct insulation, similarly to a penthouse.
  - If the laboratory is in a warehouse, it is necessary to help the air circulating between the roof and the ceiling of the laboratory rooms. Be careful of nuisance birds, rats…
  - Walls, ceilings and floors of laboratory must be thermally insulated.
  - Every door opening to the outside laboratory must be fitted out with an adapted airlock system, so that the two doors cannot open at the same time.
  - Air conditioning system must insure a small pressure in analysing rooms so that external conditions cannot interfere with the laboratory.
  - It is highly recommended to let the conditioning system running 24h per day and 7 days per week so that the room benefits of as stabilised conditions as possible. Thus, the conditioning and the complete testing of all the samples fulfil requirements of standard methods.
  - Room layout is of utmost importance. Indeed, height and structure of ceiling, as well as room volume must be known for calculating air outputs, number and position of air vents (return/renewal air).

- Economies d'énergie
- Stabilisation des conditions. Aide à demeurer dans l'atmosphère normale de conditionnement et d'essai des textiles
- Le système de conditionnement ne sera efficace que dans des conditions particulières :
  - Le laboratoire doit être au centre du bâtiment et entouré de bureaux, couloirs, etc. pour éviter l'influence des conditions extérieures : à défaut, le toit du bâtiment doit dépasser par rapport aux murs porteurs pour isoler les murs d'un ensoleillement direct et constituer une sorte d'auvent.
  - Si le laboratoire est englobé dans un hangar, il est nécessaire de favoriser une circulation d'air entre le toit et le plafond du laboratoire (attention aux oiseaux, rats…)
  - Les murs, le plafond et le sol du laboratoire doivent être isolés thermiquement du reste du bâtiment.
  - Chaque porte vers l'extérieur du laboratoire doit être équipée d'un sas d'entre d'une taille adaptée, de façon que les deux portes ne puissent pas s'ouvrir en même temps.
  - Le dispositif de conditionnement d'air doit assurer une surpression dans les salles d'analyse pour que les conditions extérieures ne perturbent pas le laboratoire.
  - Il est conseillé de laisser le conditionnement fonctionner jour et nuit, 7 jours/7 afin de stabiliser les conditions du laboratoire au maximum. Ainsi, le conditionnement et les essais sur tous échantillons peuvent être conformes aux normes.
  - L'organisation de la salle a une grande importance. En effet, la hauteur et la structure du plafond, comme le volume de la pièce doivent être connues pour le calcul des débits d'air, du nombre et de la disposition des bouches de ventilation, de reprise et de renouvellement d'air.

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3.4- Basic principles of AMS

3.4.1- Basics and drawing

- Objective: Maintain characteristics of ambient air within given tolerances

- Solution: Air Management System
  - Filtrated air distribution system
  - Control/regulation system: well-calibrated high sensitive T and RH sensors

    Measured air characteristics are compared to pre-set values; the regulation system gives commands to the operating system
  - Operating system: cooling, heating and steam humidifying (including water supply + water filtration system) systems (+ optional drying system)

    Each are provided with responsive valves to small changes demands within short delays

- Regulating system shall command **both** cooling/heating systems and humidifying/optional de-humidifying systems in the same time

- Objectif : Maintenir les caractéristiques de l'air ambiant dans les tolérances

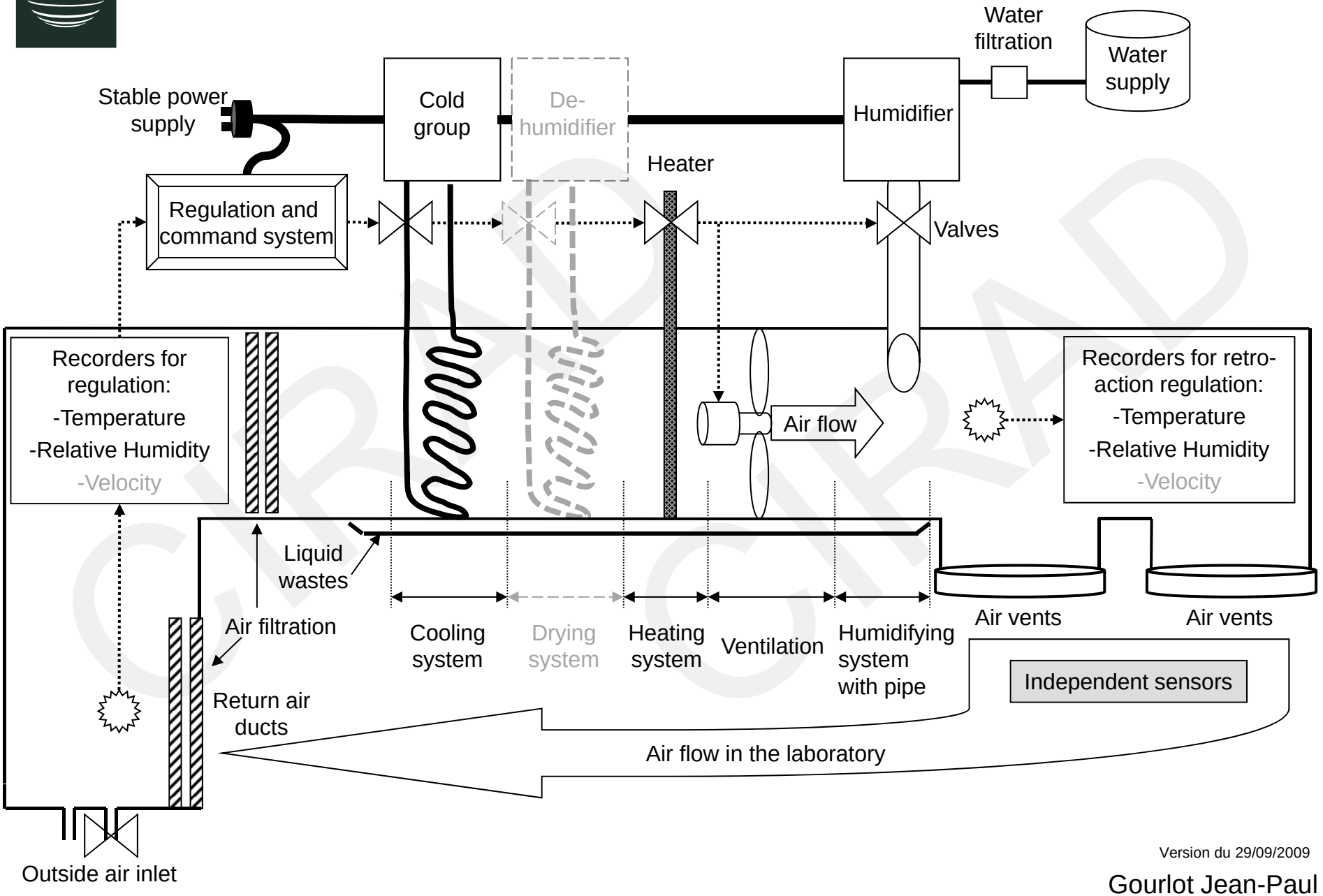
- Solution: Centrale de Traitement d'Air
  - Dispositif de distribution d'un air filtré
  - Dispositif de contrôle/régulation : sondes étalonnées et sensibles

    Les caractéristiques mesurées sont comparées à des valeurs prédéterminées ; le dispositif de régulation donne des instructions au :
  - Dispositif de fonctionnement: systèmes de refroidissement, de chauffage et d'humidification par la vapeur (dont approvisionnement d'eau filtrée) (+système de séchage facultatif)

    Chacun est équipé de valves réactives et sensibles aux faibles changements

- Le dispositif de régulation commande **à la fois** les systèmes de gestion de la température et de l'humidité

Schematic of proper air management system



Version du 29/09/2009

Gourlot Jean-Paul

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3.4- Basic principles of AMS

3.4.3- Independent vs interrelated regulation systems

- Difficulties of regulation

- If T+ then t+, h-
- If T- then t-, h+
- If H+ then h+, t+
- If H- then h-, t-

command observation

- Difficultés de la régulation

- Si T+ alors t+,h-
- Si T- alors t-,h+
- Si H+alors h+,t+
- Si H- alors h-,t-

command observation

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AMS vs independent control

Independent control

- Sensors
- Calibration
- Line
- Automaton
- Network
- Computer
- Software
- Database
- …

AMS

- **Sensors**
- **Calibration**
- **Line**
- **Comparator / Regulator**
- **Cooling system**
- **Heating system**
- **Humidifyer**
- **De-humidifyer**
- **Ventilation**
- **Air vents**
- **Air inlet**
- **Pipes**
- **…**

Result from a measurement of ambiant air characteristics in the rooms

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3.4- Basic principles of AMS

3.4.2- Summarized descriptive equipment for AMS

- List of required equipment for a proper AMS (assuming the system is correctly power supplied)

Control/regulation system	Operating system	Air flow
✓ Sensors for air temperature, relative humidity (and velocity) ✓ Calibration ✓ Comparator / Regulator ✓ Command	✓ Cooling system ✓ Heating system ✓ Steam humidifying system, water supply and filtration ✓ Drying system = dehumidifier (optional)	✓ Pipes (air ducts) ✓ Air inlets ✓ Air filtration ✓ Ventilation+air vents ✓ Aspiration+return air ducts

- Accuracy requirements for T and RH sensors:
  - regulation sensors, part of AMS equipment
  - Independant sensors, for equipment checking

Standard	Temperature		Relative Humidity	
	Resolution	Uncertainty	Resolution	Uncertainty
ISO 139:2005	0.1°C or better	± 0.5°C	0.1% or better	± 2.0%
ASTM D 1776-08	N/A	N/A	N/A	N/A

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3.4- Basic principles of AMS

3.4.2- Summarized descriptive equipment for AMS

- Equipment observed during expertise and their corresponding for a proper AMS

	Humidification	Air pipes	Cold group	Regulation	Adjustment
Observed material	Spray or fog humidification system	Air pipes without adjustable air vents	Cold group: single-stage vapour-compression refrigeration system (gas circulation)	Independent regulation systems (thermostat, hygrostat)	Binary system for valve opening command (0: close or 1: open)
Corresponding material for proper AMS	Steam humidification system	Air pipes with adjustable air vents (velocity control)	Cold group: chilled water as a refrigerant (water circulation)	Regulating system for both temperature and relative humidity (industrial PID regulators)	Fine adjustment for valve opening command (gradually opened from 0 to 100%)

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3.4- Basic principles of AMS

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- Other recommandations

  - Equal distribution of the air: location of air vents and return air ducts must be adapted to each laboratory, depending on the areas of interest (to be defined),

  - Heating/cooling capacity: adding only power is not necessarily sufficient ; exchange surfaces on heating/cooling coils must also be adjusted.

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3.4- Basic principles of AMS

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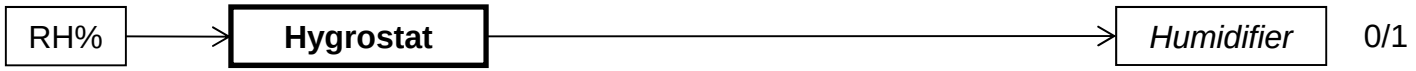
3.4- Basic principles of AMS

3.4.3- Independent vs interrelated regulation systems

+

Wrong regulation system



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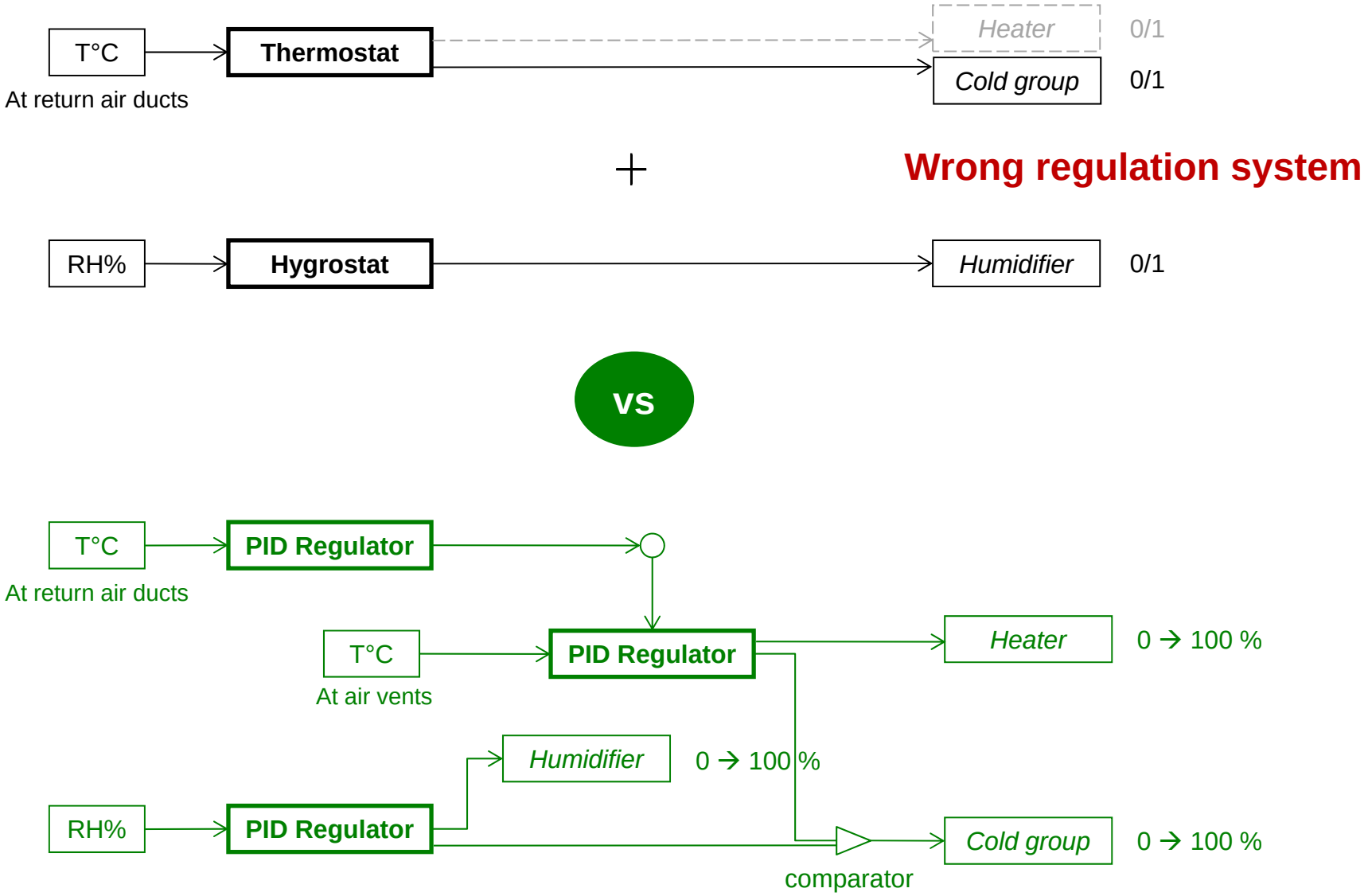
3.4- Basic principles of AMS

3.4.3- Independent vs interrelated regulation systems



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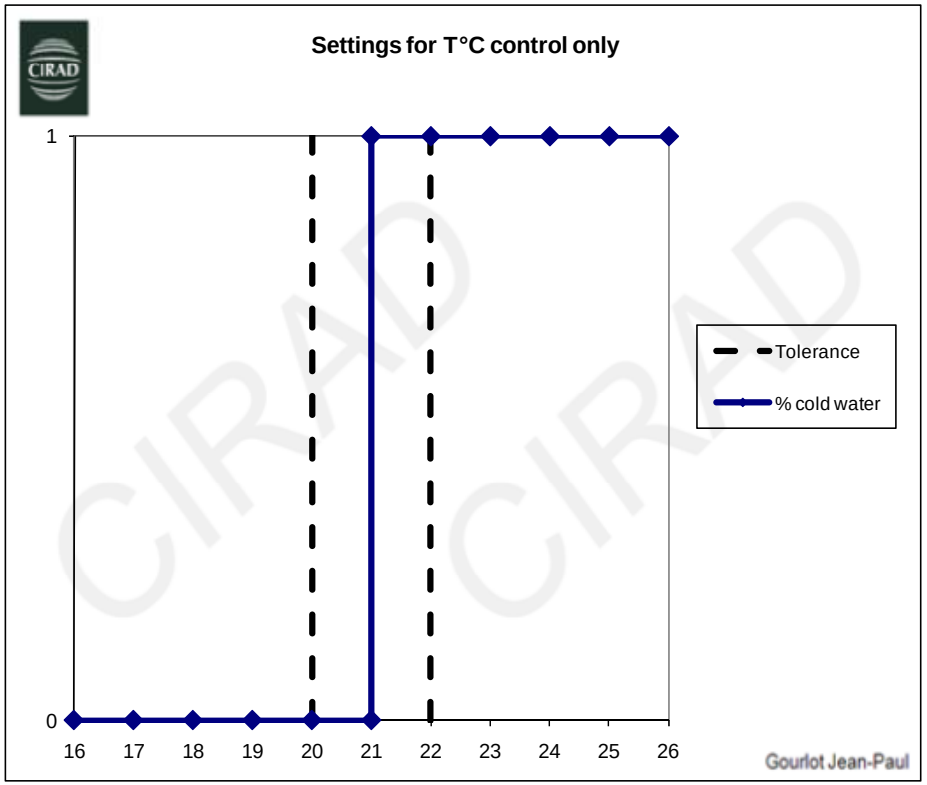
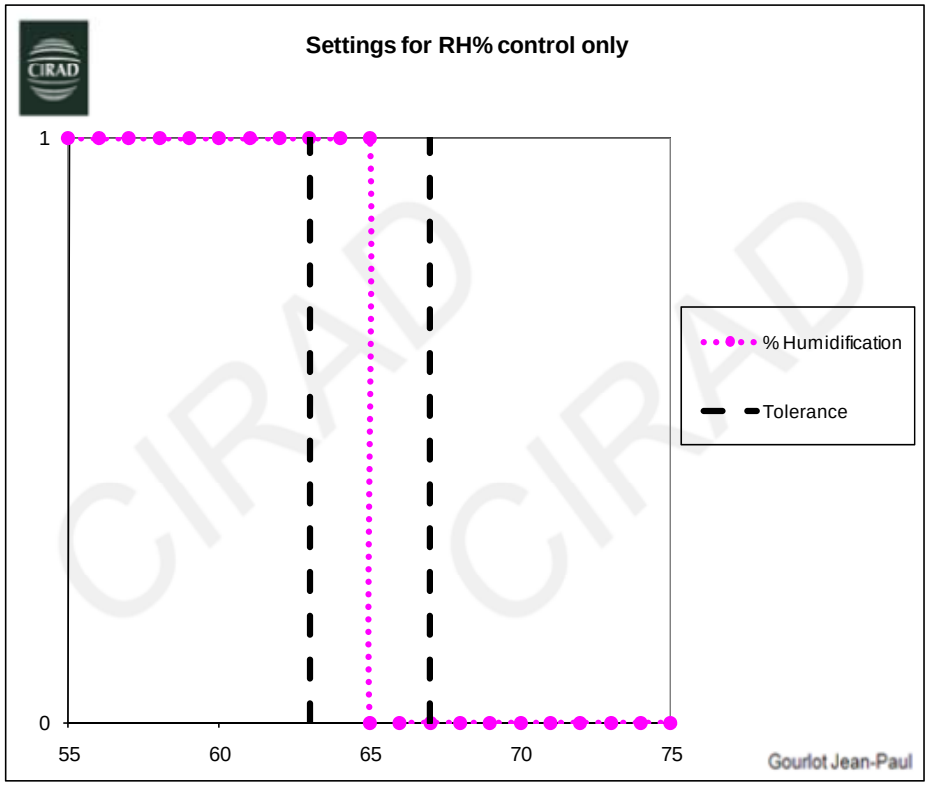
3.4- Basic principles of AMS

3.4.3- Independent vs interrelated regulation systems





Settings for independent cold goup and humidifier regulations

Wrong regulation system

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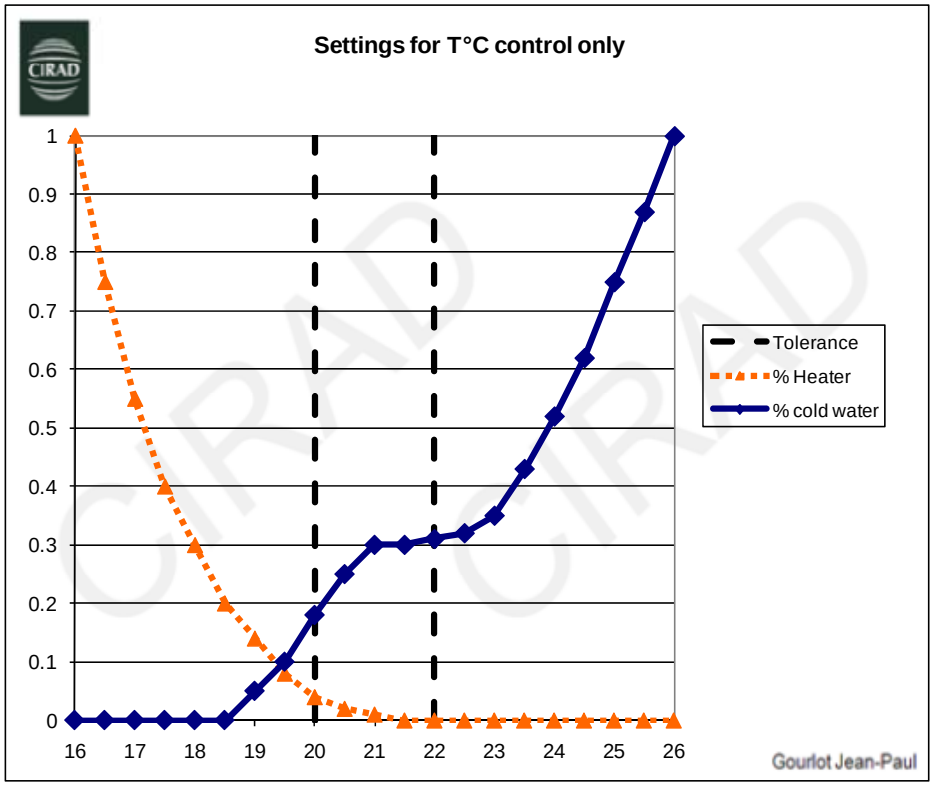
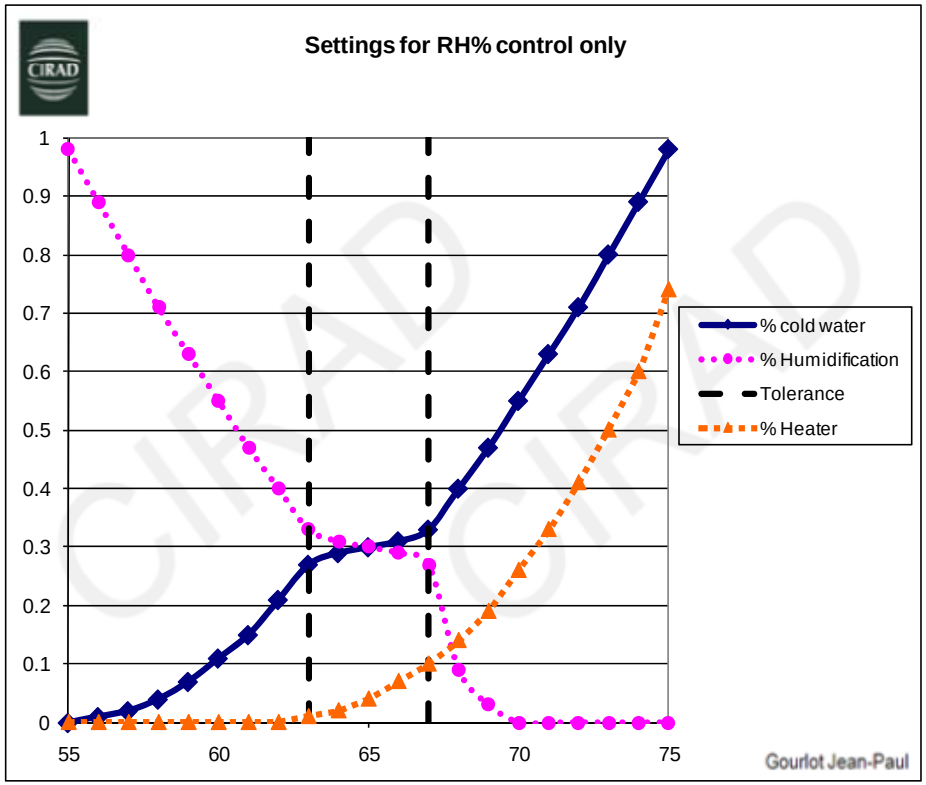
3.4- Basic principles of AMS

3.4.3- Independent vs interrelated regulation systems





Settings for interrelated chiller, heater and humidifier regulation
Correct regulation system

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Plan of presentation

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AMS vs independent control

Independent control

- **Sensors**
- **Calibration**
- **Line**
- **Automaton**
- **Network**
- **Computer**
- **Software**
- **Database**
- **…**

AMS

- Sensors
- Calibration
- Line
- Comparator / Regulator
- Cooling system
- Heating system
- Humidifyer
- De-humidifyer
- Ventilation
- Air vents
- Air inlet
- Pipes
- …

Result from a measurement of ambiant air characteristics in the rooms

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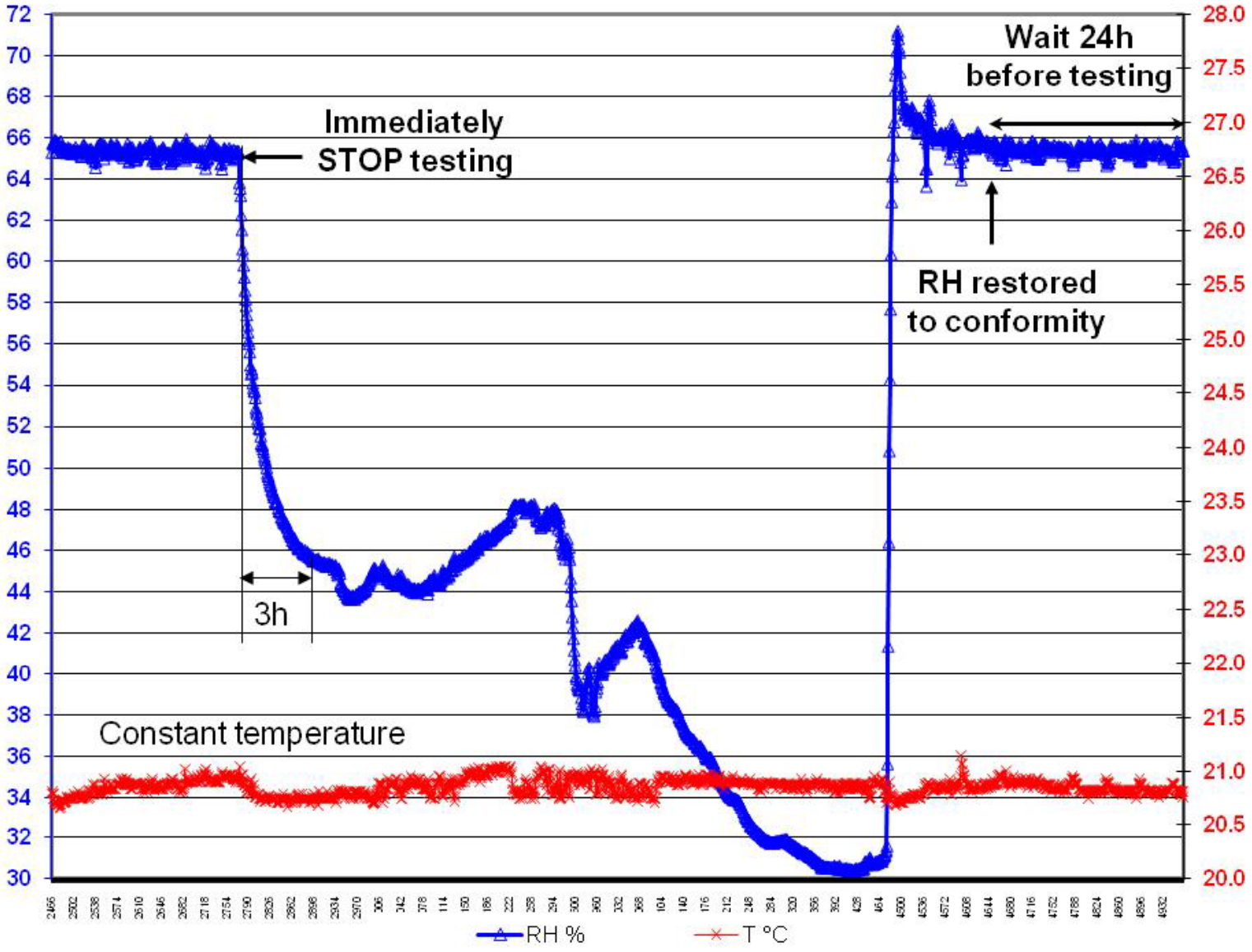
4.1- Example of short-time variation due to system failure



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4.2- Routine control procedure

4.2.1- General information

- Aim: prove that mean T and RH are stable within the tolerances over any continuous 1h period despite short-time and long-time heat variations
- Equipement: sensors independent from regulation system and as much sensitive
- Measurements:
  - at various locations: mini 1 sensor per 50 m^3 *(ISO 139:2005 Annex A)*
  - carried out periodically (e.g. 1 per min for digital or electronic equipment)
  - recorded round-the-clock and printed on a graph to check the ability of the conditioning device to respect permanently the tolerances
  - stored and easily released for investigation in case of controversial laboratory results. Keep all documents for traceability of sensor calibration and maintenance and of results.

- But : montrez que T et HR sont dans les tolérances pour n'importe quelle moyenne sur 1h malgré les fluctuations à court et long terme
- Equipement : sondes indépendantes de la régulation mais tout aussi sensibles
- Mesures :
  - à divers endroits : mini 1 sonde par 50 m^3 *(ISO 139:2005 Annex A)*
  - périodiques (ex : toutes les min pour les appareils électroniques)
  - enregistrées 24h/24 et imprimées sur un graphique pour vérifier de l'aptitude du dispositif à respecter les tolérances de manière permanente
  - stockées pour éventuellement les examiner en cas de contestation des résultats. Conserver tous les documents pour le traçabilité des étalonnages et de l'entretien préventif des capteurs ainsi que celle des résultats.

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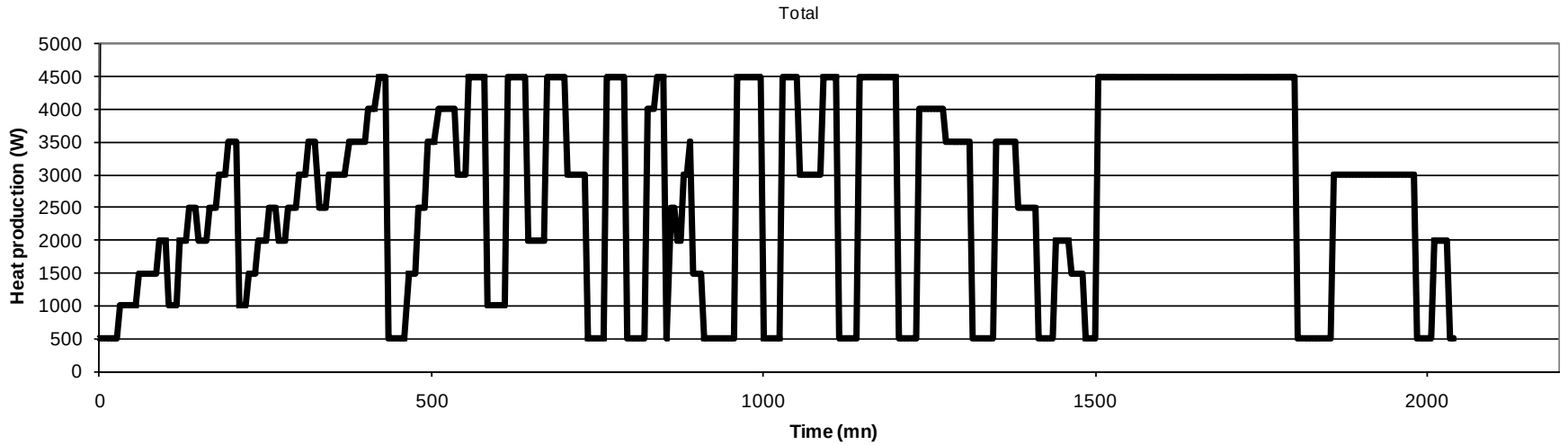
4.2- Routine control procedure

4.2.2- Checking the functioning

- When? Approving a new AMS installation / Periodic verification
- How? Heat changing experiment
- Observe the consequences of the changes on T and RH
- Observe how the system is reacting → Conclude how to settle better regulation rules and setting

- Quand ? Approbation de l'installation d'une CTA / Vérification périodique
- Comment ? Expérimenter l'évolution des sources de chaleur
- Observer les conséquences des variations sur T et HR
- Observer la réaction du système → Conclure sur les actions d'amélioration

Heat production in the room changing with heat sources activating
La puissance calorifique dans la salle évolue avec les variations des sources de chaleur



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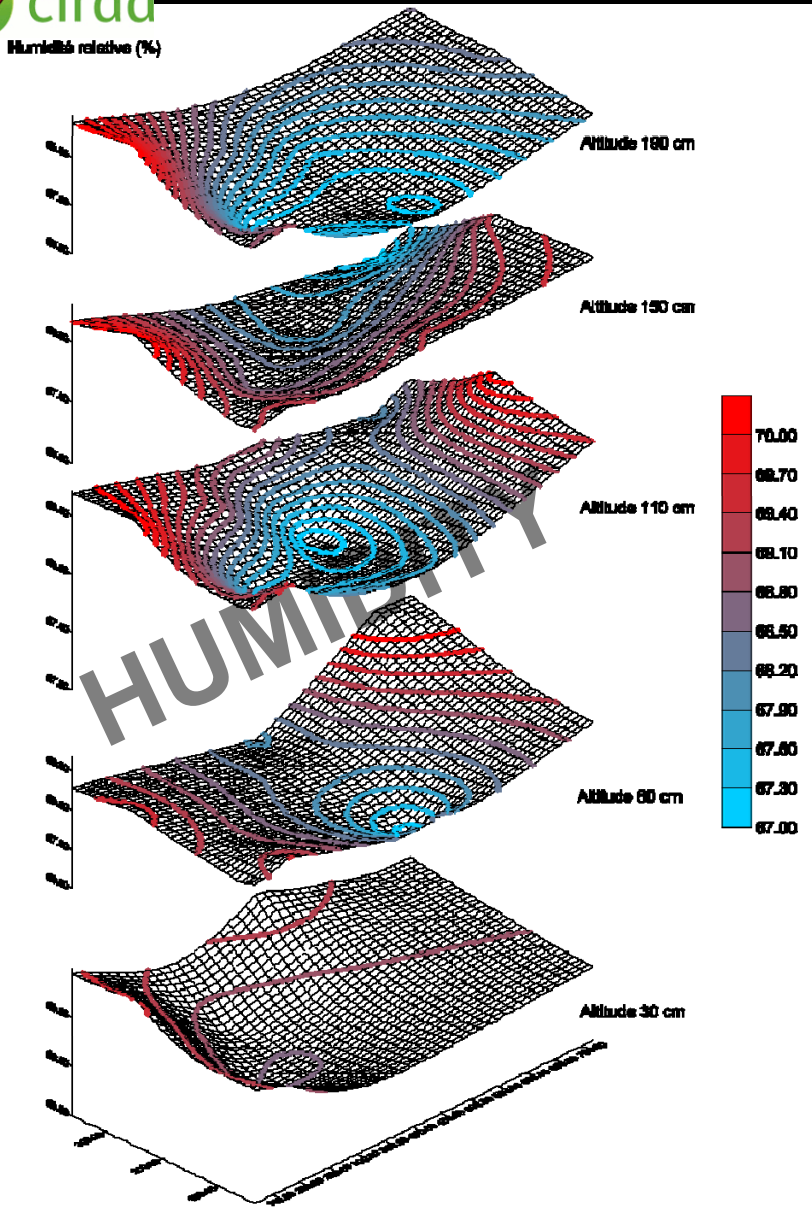
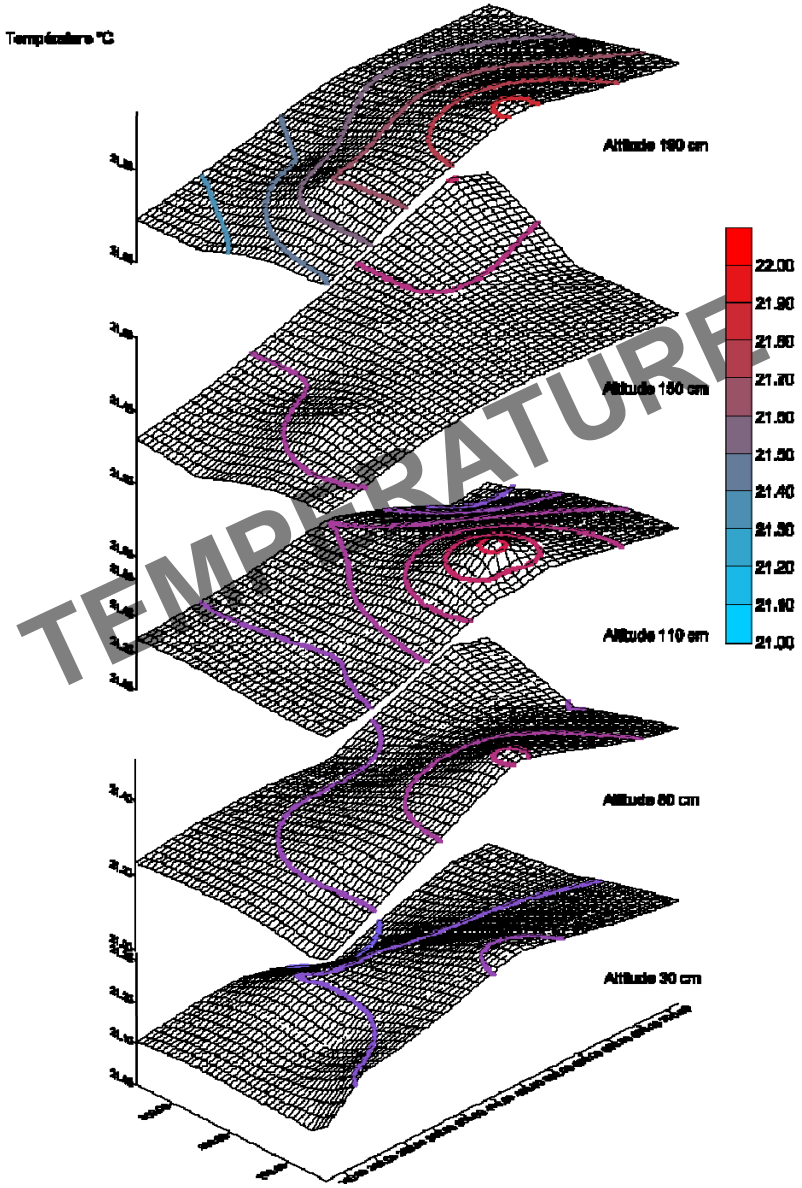
4.2- Routine control procedure

4.2.3- Example





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4.2- Routine control procedure

4.2.3- Example

Step 1: Studying the impact of external surroundings

Etape 1 : Etudier les influences extérieures

Step 2: Checking that sensors give reliable results

Etape 2 : Vérifier que les capteurs sont fiables

Step 3: Organising the volumetric measurements

Etape 3 : Organiser le système de mesures volumétrique

Step 4: Volumetric conditions measuring

Etape 4 : Mesurer la variabilité volumétrique des conditions

Step 5: Results gathering and interpreting

Etape 5 : Collecter et analyser les résultats

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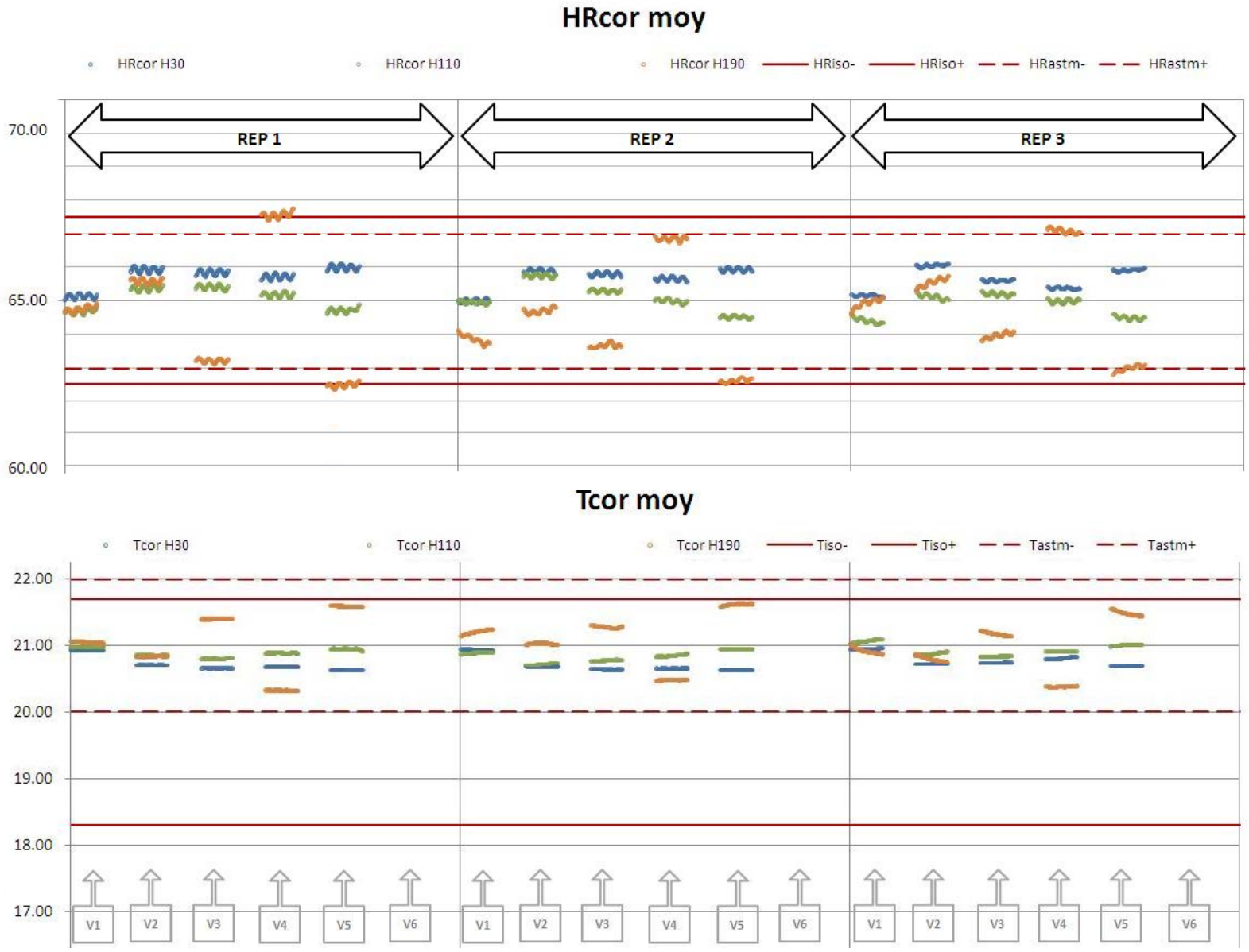
4.2- Routine control procedure

4.2.3- Example



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4.2- Routine control procedure

4.2.3- Example

- Duration (tests) — Duration (operator)

  Step 2 : 2 h (3 sensors simultaneously) x 3 rep
  = 6 h (on **1 day**) — 1h30 on 1 day

  Step 4 : 3 heights x 2 h (4 à 10 verticals simultaneously) x 3 rep
  = 18 h (on **3 days**) — 4h30 on 3 days

  Step 5 : requests + interpretation
  1 day (complete)

→ Total: one week of **5 days**

- Durée mesures — Temps opérateur

  Etape 2 : 2 h (3 sondes simultané) x 3 rép
  = 6 h (sur **1 jour**) — 1h30 sur 1 jour

  Etape 4 : 3 hauteurs x 2 h (4 à 10 verticales simultané) x 3 rép
  = 18 h (sur **3 jours**) — 4h30 sur 3 jours

  Etape 5 : requêtes + interprétation
  1 jour complet

→ Total sur une semaine de **5 jours**

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Plan of presentation

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5- Conclusion

- For complete satisfaction of AMS, 2 requirements are complementary:
  - power supply must be adapted
  - maintenance shall be performed regularly on AMS single elements

- You should now be able to:
  - respect completely the basic standards required for cotton testing
  - evaluate the ability of a manufacturer/ subcontractor to do his job
  - modify your climate system if necessary
  - prove your ability to maintain atmospheric condition within the worldwide agreed tolerances

- Call upon an engineering expert in air conditioning for laboratory if necessary

- Pour entière satisfaction de la CTA, 2 conditions complémentaires :
  - une alimentation en énergie adaptée
  - une maintenance régulière des éléments de la CTA

- Vous devriez maintenant pouvoir :
  - respecter complètement les normes relatives aux essais sur coton
  - évaluer la capacité d'un fabricant/sous-traitant à travailler correctement
  - modifier votre installation de conditionnement d’air si besoin
  - prouver votre capacité à maintenir les conditions atmosphériques dans les tolérances internationales

- Faire appel à un expert en ingénierie du conditionnement d’air pour laboratoire si besoin

All details in:

Tous les détails dans :

PAYET L., GOURLOT J-P., 2010, Rapport “D.1.3. Development of a list of requirements and basic principle drawings for a simple and efficient integrated climate control system”, Project CFC/ICAC/33, 23 p.

Thanks for your attention

General maintenance guide for all equipment used in cotton testing laboratories

Guide de maintenance générale pourles équipements de laboratoires

GOURLOT J.-P.

Arusha, January 2012

From a joint work by:
A partir d'un travail conjoint de :
Payet L., Lassus S., Gourlot J.- P.

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Plan of presentation

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1- Introduction

- Maintenance: factor influencing test results
- Plan a maintenance activity on:
  - all the testing instruments of the laboratory (SITC)
  - its Air Management System equipment (AMS)
- ISO 17025: improvements → preventive and corrective actions
- Preventive maintenance = keep the equipment working (+extend its life)
- Corrective maintenance = make the equipment work again after failure

- Maintenance: facteur pouvant influencer les résultats des tests
- Planifier une maintenance sur :
  - tous les instruments de mesure du laboratoire (CMI)
  - le système de gestion du conditionnement d'air (CTA)
- ISO 17025: améliorations → actions préventives et correctives
- Maintenance préventive = maintenir l'équipement en fonctionnement (+rallonger sa durée de vie)
- Maintenance corrective = réparer l'équipement après une panne

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1- Introduction

- Preventive maintenance: highly recommended (cost often lower than estimated cost for waiting breakdown and repairing)

- Cost of failure takes into account many factors:
  - Time spent at a cost of labor technicians
  - Possible intervention of outside experts
  - Stock of Spare Parts
  - Loss of production during the shutdown
  - Penalties related to any delay in delivery
  - Loss of brand image

- Maintenance préventive : fortement recommandée (coût souvent moins élevé que le coût estimé de la panne et sa réparation)

- Coût de la panne prend en compte plusieurs éléments :
  - Temps passé par le techniciens
  - Intervention éventuelle d'experts extérieurs
  - Stock de pièces de rechange
  - Perte de productivité durant la panne
  - Pénalités dues aux retards de rendu résultats
  - Sensibilisation de l'image du labo

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Summary

Maintenance type	Preventive		Corrective
	Periodic: condition-monitoring tasks	**Predictive:** life-extending tasks	
Aim	Prevention from deterioration Maintain in satisfactory operating conditions	Prevent faults from occurring Prevent from failing Measure deterioration Identify problems	Repair Restore Replace
Who?	Personnel using the equipment daily + person in charge of maintenance	Person in charge of maintenance	Person in charge of maintenance / sub-contractor / manufacturer
When?	Periodic inspection, routine	Inspection to be scheduled regularly	After mechanical or electrical failure
What?	Care, servicing	Inspecting, diagnosis	Analysing and solving the problem
How?	Cleaning, adjusting, lubricating/oiling, testing	Inspecting, testing, and then correcting, adjusting and/or replacing parts	Parts replacement

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Plan of presentation

Cotton Testing in Africa
CSITC - Project

1- Introduction

2- Preventive maintenance

- **2.1- Periodic maintenance**
- **2.2- Predictive maintenance**
- **2.3- Signs of dysfunction**

3- Corrective maintenance

4- Conclusion

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2- Preventive maintenance

- *Aim*: Keeping equipment in good operating conditions and reliable + Avoid breakdown/dysfunction

- According to manufacturer's advice
- Check efficiency of equipment in routine → conclude reliable if ok
- Two levels:
  1. **periodic maintenance**
  2. **predictive maintenance**

- *But*: maintenir l'équipement en bonnes conditions et fiable + éviter panne/dysfonctionnement

- Selon les conseils du constructeur
- Contrôler l'efficacité de l'équipement en mode routine → juger fiable si ok
- Deux niveaux :
  1. **maintenance périodique**
  2. **maintenance prédictive**

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2- Preventive maintenance

2.1- Periodic maintenance

- *Aim*: prevent from deterioration (condition-monitoring)
- *Who*? well-trained personnel using the equipment daily + person in charge of maintenance
- *When*? daily + periodic inspections (daily, weekly, monthly or annually)
- *What*? cleaning, adjusting, oiling and testing any equipment in the lab
- *How*?
  - use pre-established follow-up forms
    - 1 form per laboratory (room)
    - 1 form per instrument
  - use maintenance books if necessary
  - use vacuum cleaner, brush, cleaning paper, lubricant, screwdrivers, measuring instruments…
- Check efficiency of equipment in routine → conclude reliable if ok

- *But*: empêcher la détérioration (surveillance de l'état machine)
- *Qui*? personnel habilité utilisant le matériel quotidiennement + responsable de la maintenance
- *Quand*? quotidien + périodique (quotidien, hebdomadaire, mensuel, annuel)
- *Quoi*? nettoyer, ajuster, graisser et tester tout équipement du labo
- *Comment*?
  - utiliser des fiches de suivi préétablies
    - 1 fiche par laboratoire (salle)
    - 1 fiche par instrument
  - utiliser les cahiers de maintenance
  - utiliser un aspirateur, des brosses, du papier de nettoyage, du lubrifiant, tournevis, instruments de mesure…
- Contrôler l'efficacité de l'équipement en mode routine → juger fiable si ok

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2- Preventive maintenance

2.2- Predictive maintenance

- *Aim*: prevent faults from occurring in the long-term (life-extending)
- *Who*? person in charge of maintenance
- *When*? scheduled regularly, even if less frequent than routine
- *What*? identify imminent troubles and bring solutions to prevent equipment from failing
- *How*? inspecting, testing and then correcting, adjusting and/or replacing parts

- *But*: empêcher les failles sur le long terme (rallonger la durée de vie)
- *Qui*? responsable de la maintenance
- *Quand*? à planifier régulièrement, moins fréquent que la routine
- *Quoi*? identifier les problèmes imminents et apporter des solutions pour éviter la panne
- *Comment*? inspecter, tester et corriger, ajuster et/ou remplacer des pièces

- Check efficiency of equipment in routine → conclude reliable if ok
- Report in appropriate maintenance books for traceability

- Contrôler l'efficacité de l'équipement en mode routine → juger fiable si ok
- Reporter l'action dans le cahier de maintenance approprié pour assurer la traçabilité

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2- Preventive maintenance

2.3- Signs of dysfunction

Maintenance

- Suspect or outside specified limits results OR item dysfunction sometimes only observed during preventive maintenance inspection
- Equipment cannot be considered as operational → reset/repair and prove reliable → operational again

SITC: Tests on well-known cottons

- CSITC Round Tests: opportunity to compare results with other labs
- Universal calibration standards (or internal standards): daily used
- Suspected SITC drifting or observed significant difference in the level → perform calibration (check)
- (make sure first it is not due to not well managed atmospheric conditions)

Maintenance

- Résultats suspects ou hors tolérances OU dysfonctionnement d'un module observé seulement lors de l'inspection de maintenance préventive
- Equipement ne peut pas être considéré opérationnel → ajuster/réparer et prouver la fiabilité → opérationnel

CMI : Tests sur cotons connus

- CSITC Round Tests: comparaison des résultats à ceux des autres labos possible
- Universal calibration standards (ou internes) : utilisé quotidiennement
- Soupçon de dérive ou observation de différence de niveau significative → réaliser un étalonnage (ou vérification)
- (s'assurer au préalable que cela ne provienne pas de difficultés de gestion des conditions atmosphériques)

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Plan of presentation

Cotton Testing in Africa
CSITC - Project

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3- Corrective maintenance

- *Aim*: quickly restore the equipment and making it reliable again
- *Who*? person in charge of maintenance/subcontractor
- *When*? after a mechanical or electrical failure
- *What*? analysing the problem and solving it
- *How*?
  1. Report failure to chief of lab
  2. Provide info that will help finding the source of disruption
     - breakdown associated with noise?
     - with/without signal?
     - with burnt smell?
     - …?
  3. Search info from technical files (mechanical plans, electronic diagram, instrument settings…)

- *But*: réparer l'équipement et le rendre de nouveau fiable
- *Qui*? responsable de la maintenance/sous-traitant
- *Quand*? Après une panne mécanique ou électrique
- *Quoi*? analyser et résoudre le problème
- *Comment*?
  1. Rapporter la panne au chef du labo
  2. Fournir toutes les infos pour trouver l'origine de la panne
     - panne associée à un bruit?
     - à une alerte sonore/lumineuse?
     - à une odeur de brûlé?
     - …?
  3. Chercher des infos dans les docs techniques (plans mécaniques, diagramme électronique, réglages de l'instrument…)

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3- Corrective maintenance

4. Use measuring instruments such as a slide caliper, a multimeter, or an oscilloscope
5. Issue identified → use spare parts (mechanical parts, set of cards) and repair

- Check efficiency of equipment in routine → conclude repaired and reliable if ok
- Report in appropriate maintenance books for traceability

4. Utiliser des instruments de mesure tels que pied à coulisse, multimètre, oscilloscope
5. Problème identifié → utiliser des pièces de rechange (pièces mécaniques, jeu de cartes électroniques) et réparer

- Contrôler l'efficacité de l'équipement en mode routine → juger réparé et fiable si ok
- Reporter l'action dans le cahier de maintenance approprié pour assurer la traçabilité

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Plan of presentation

Cotton Testing in Africa
CSITC - Project

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4- Conclusion

- In order to provide long term monitoring, all inspections done during preventive or corrective maintenance should be:
  - listed
  - recorded
  - archived every year

- In case additional disruptions would happen to the same device, gathered information should help evaluating and/or solving the situation

- Information could also be used as a model for resolution when a similar failure occurs to another device

- Afin de surveiller à long terme, toutes les inspections faites pendant la maintenance préventive ou corrective doivent être :
  - listées
  - enregistrées
  - archivées chaque année

- Au cas où d'autres pannes se produiraient sur la même machine, l'information recueillie permettrait d'évaluer et/ou de résoudre le problème

- L'information pourrait également servir de modèle à la résolution d'une situation semblable si elle se produisait sur une autre machine

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Summary

Maintenance type	Preventive		Corrective
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How?	Cleaning, adjusting, lubricating/oiling, testing	Inspecting, testing, and then correcting, adjusting and/or replacing parts	Parts replacement

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Résumé

Type de maintenance	Préventive		Corrective
	Périodique: tâches de surveillance	**Prédictive:** tâches pour rallonger la durée de vie	
But	Prévenir contre la détérioration Maintenir dans de bonnes conditions	Empêcher les failles Prévenir contre les pannes Mesurer la détérioration Identifier les problèmes	Réparer Restaurer Remplacer
Qui?	Personnel utilisant le matériel quotidiennement + responsable de la maintenance	Responsable de la maintenance	Responsable de la maintenance / sous-traitant / fabricant
Quand?	Inspections périodiques, routine	Inspections à prévoir régulièrement	Suite à une panne mécanique ou électrique
Quoi?	Entretenir, précautions	Inspecter, diagnostiquer	Analyser and résoudre le problème
Comment?	Nettoyer, ajuster, lubrifier/graisser, tester	Inspecter, tester, puis corriger, ajuster et/ou remplacer des pièces	Remplacement de pièces

All details in:

Tous les détails dans :

PAYET L., GOURLOT J-P., 2010, Rapport "General maintenance guide for all equipment used in cotton testing laboratories", Project CFC/ICAC/33, 14 p.

Thanks for your attention

Variability results of homogenized cottons by a new laboratory cotton homogenizing machine

Résultats de variabilité de cotons homogénéisés par le nouveau ouvreur-mélangeur de fibres de coton

GOURLOT J.-P.

Arusha, January 2012

From a joint work by:
A partir d'un travail conjoint de :
Payet L., Gourlot J.- P., Azuara C.
Présenté à l'ITMF, Bremen, March 2010

This project is co-funded by the European Union and the Common Fund for Commodities

Plan of presentation

- Introduction
- Homogenizing machine description
- Effect of machine on mixed cottons
- Effect of machine on homogenized cotton
- Conclusion

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Plan of presentation

- **Introduction**
- Homogenizing machine description
- Effect of machine on mixed cottons
- Effect of machine on homogenized cotton
- Conclusion

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Introduction

- Scope of the study
  - Prepare cottons for round tests
  - Several cottons covering a range of characteristics are tested
  - Goal: Compare every lab result to the labs mean result
    - ➔ **<u>Avoid raw material variability impact on laboratory results</u>**

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Introduction

- For any participating cotton
  - proper reading level within a chosen range for the required characteristics (many samples, many repetitions)
  - low variability
    - If good level, and low variability ➔ cotton selected
    - If not, according to given thresholds
      - Cotton rejected
      - **Cotton could be homogenized**

- CFC/ICAC/33 project, Regional round tests in Africa

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Introduction

- The homogenizing machine should ensure
  - a gentle processing (mean unchanged)
  - a decrease in within-cotton variability
  - an easy processing
  - an easy sampling of cotton fibre masses to be sent to every participating lab

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Plan of presentation

- Introduction
- **Homogenizing machine description**
- Effect of machine on mixed cottons
- Effect of machine on homogenized cotton
- Conclusion

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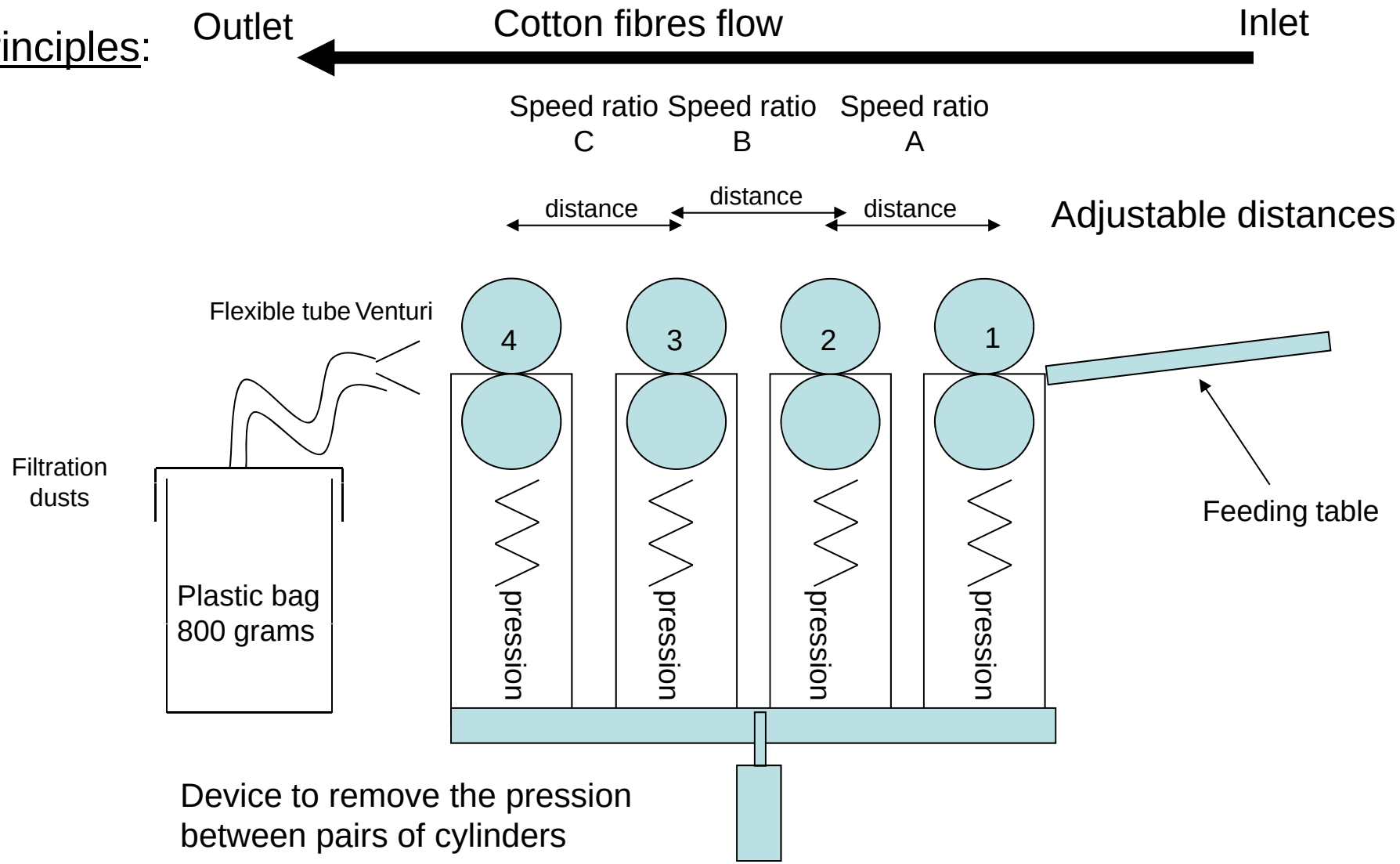
The homogenizing machine

Principles:



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The homogenizing machine

Picture:

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Plan of presentation

- Introduction
- Homogenizing machine description
- **Effect of machine on mixed cottons**
- Effect of machine on homogenized cotton
- Conclusion

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Mixing cottons with the machine

- Objective
  - Mix 2 types of cottons
  - Observe a difference of variability between “raw” and mixed samples

H0: homogenizing machine reduces the variability of two cottons chosen to be drastically different on their length and strength properties when mixed together

Exp. 1 small samples (40 g) → 1A: mixing
→ 1B: mixing+“doubling”

Exp. 2 larger masses (4 kg) → 2A: mixing
→ 2B: mixing+“doubling”

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Mixing cottons with the machine

- Materials
  - Cottons: LS and SW stacked up on the feeding table
  - Homogenizing machine:
    - » Speed ratios fixed
    - » Distances between pairs of cylinders
    - » Pressure between cylinders
    - » Pressure drop in venturi
  - SITC testing:
    - HVI 1000 M700
    - 2 Mic, 6 LS, 6 CT on 40g or 200g samples

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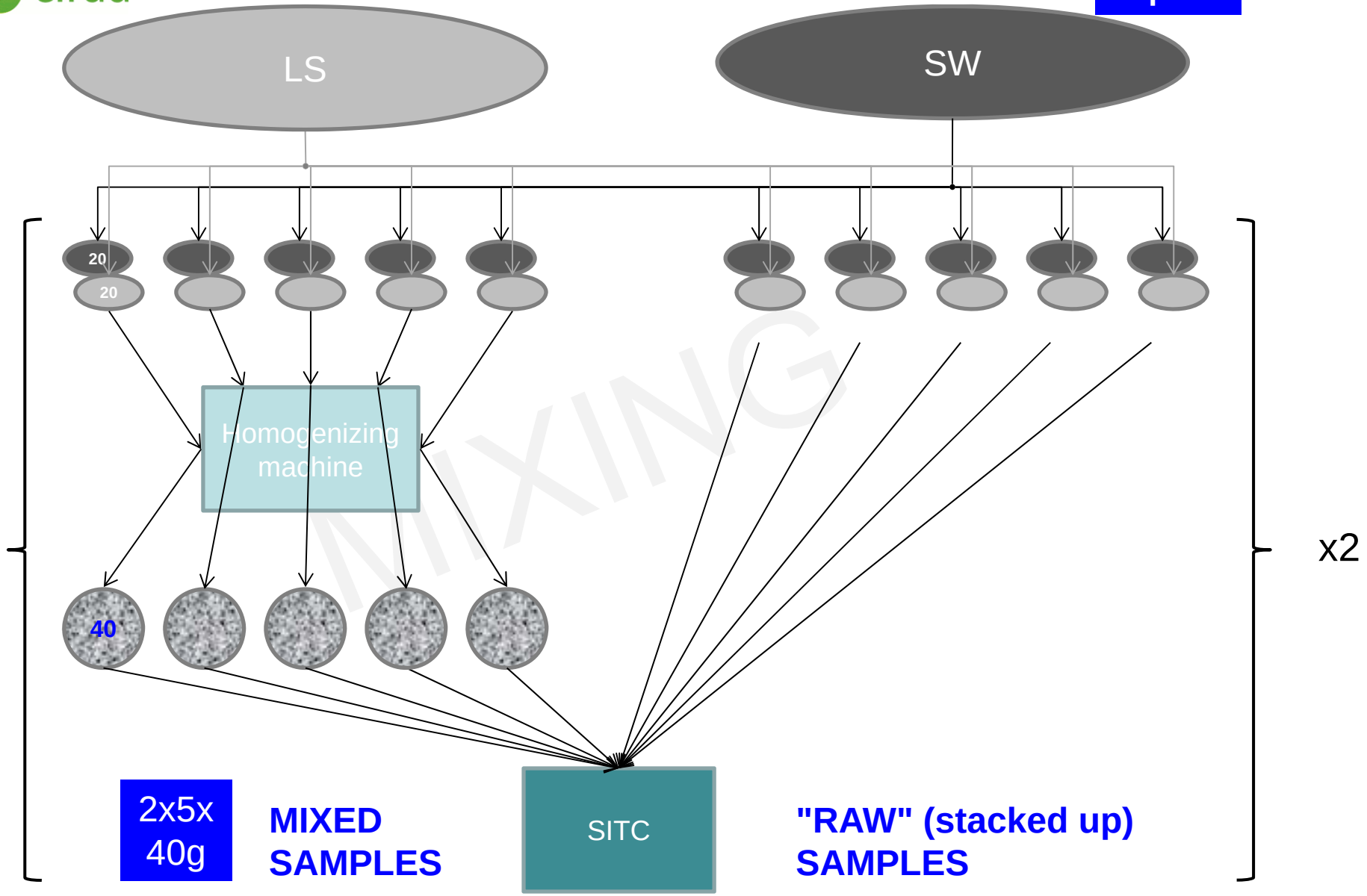
Mixing cottons with the machine : Protocol

Exp. 1A



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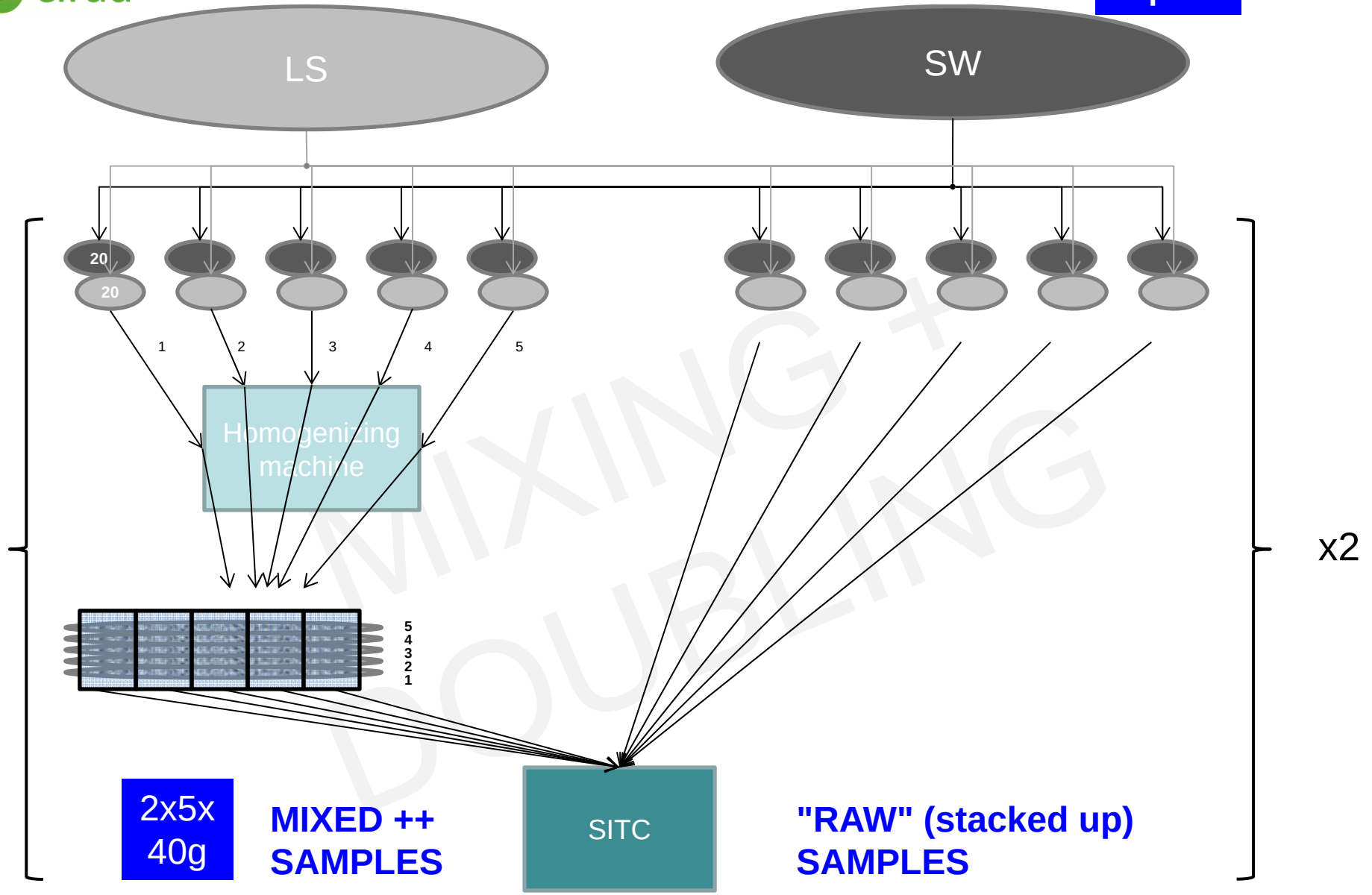
Mixing cottons with the machine: Protocol

Exp. 1B



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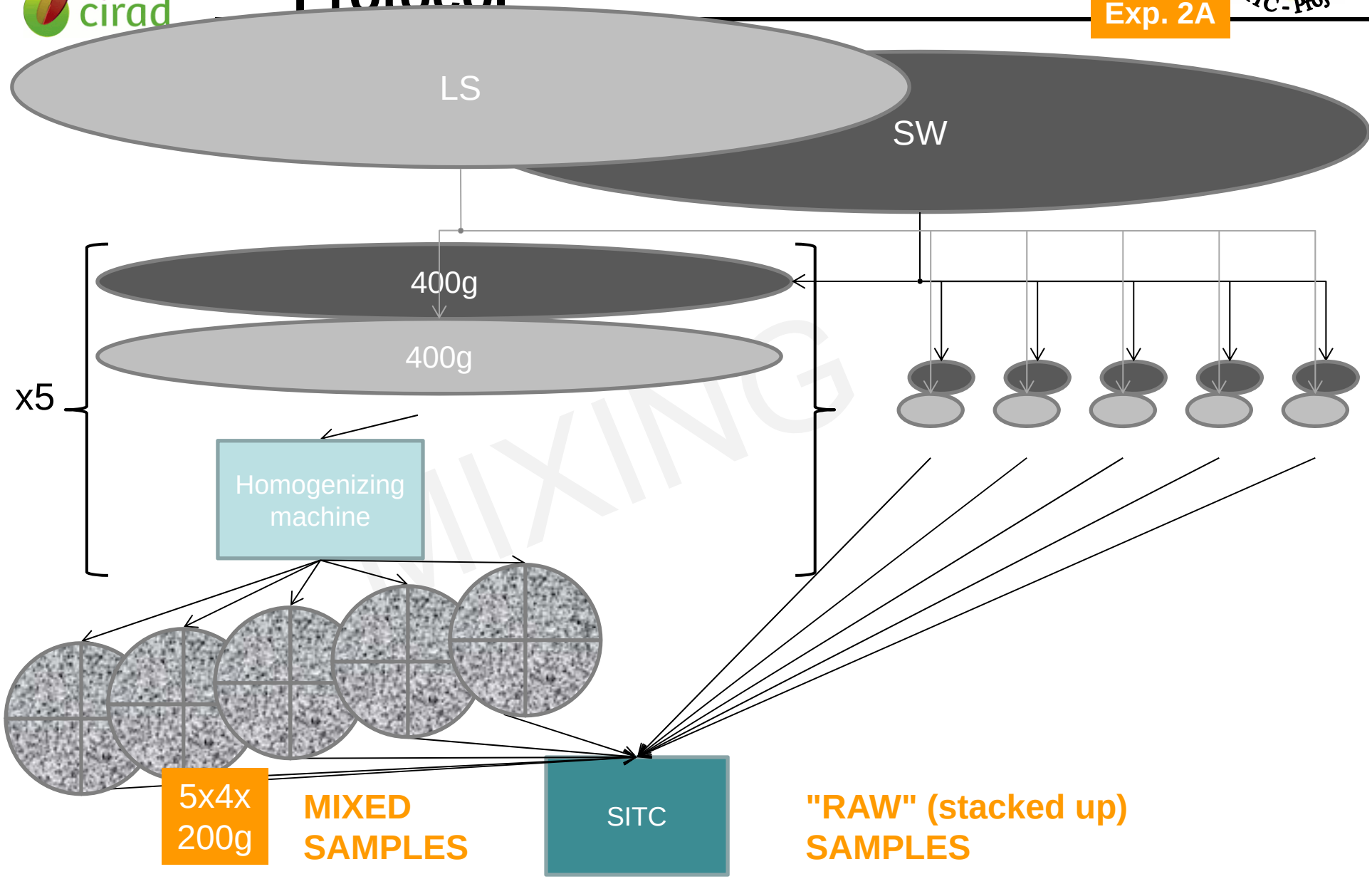
Mixing cottons with the machine : Protocol

Exp. 2A



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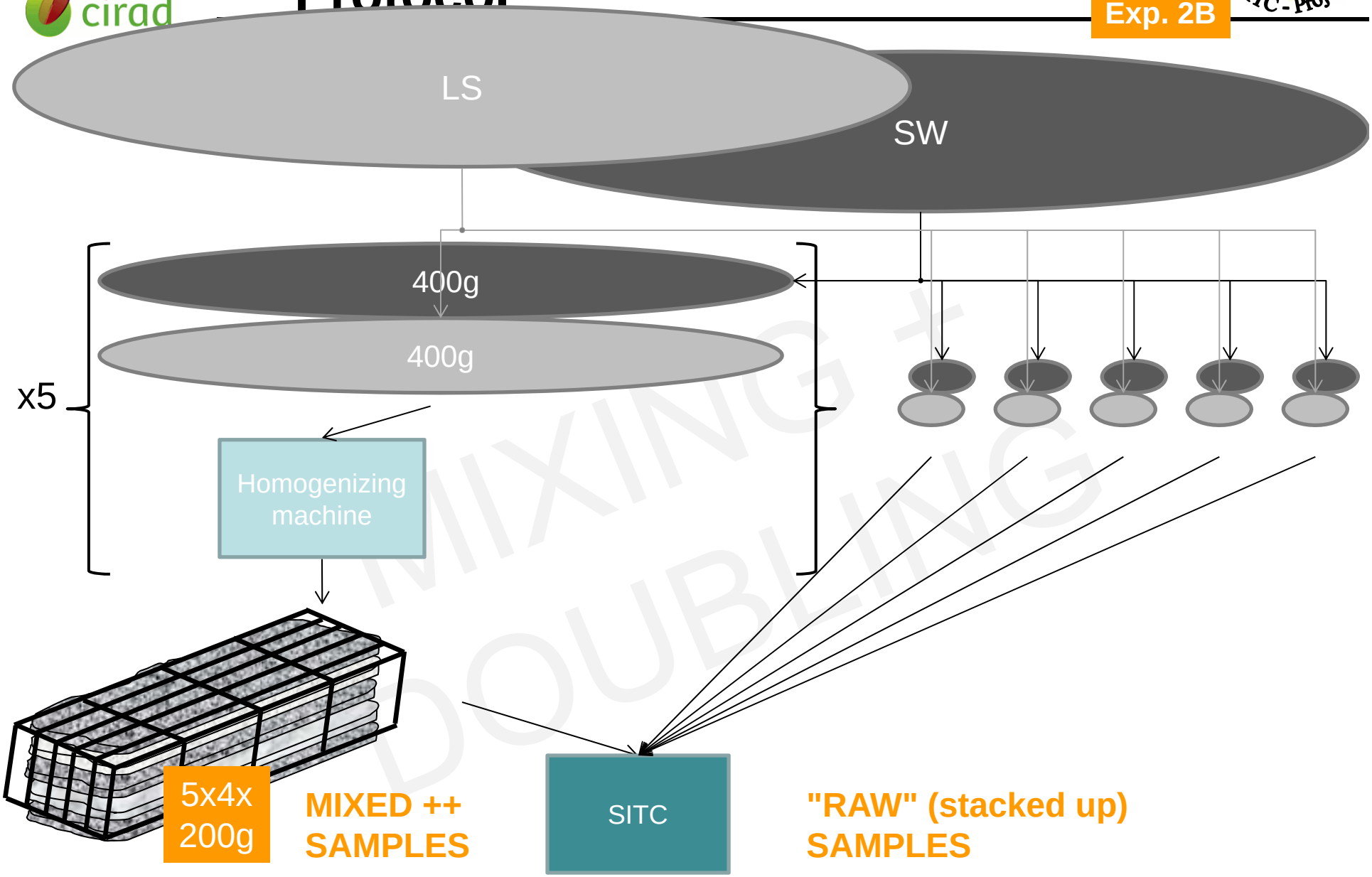
Mixing cottons with the machine : Protocol

Exp. 2B



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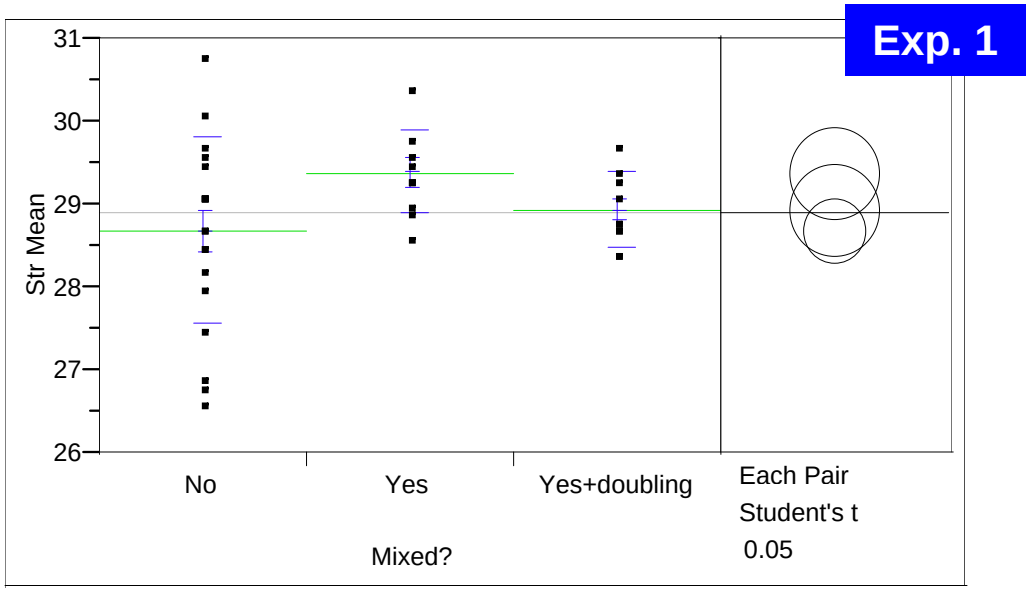
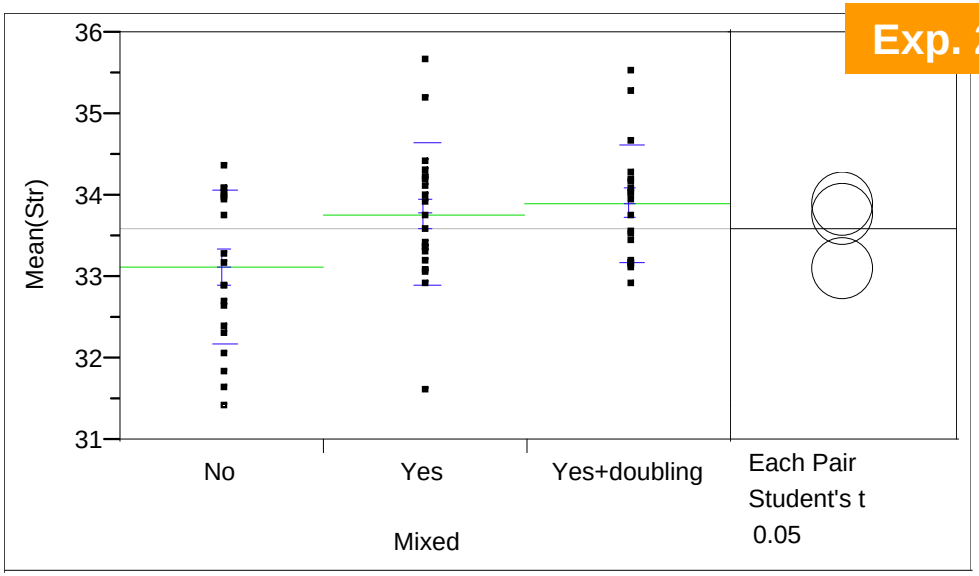
Effect of machine on within-cotton variability: results

- Results
  - Example: strength





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Effect of machine on within-cotton variability: results

Mix small samples (40 g)

Exp. 1

F-ratio: raw:mixed

if > 1 → variability tend to decrease

the higher, the more effect of mixing

1A: mixing

Parameter	Mean		Variance		F ratio	Pr>F	Trend to
	Raw	M	Raw	M			
Mic	4.32	4.28	0.00221	0.00042	4.9	0.01	decrease significantly
UHML mm	27.97	28.31	0.20347	0.05514	3.5	0.03	decrease significantly
UI %	80.94	80.63	0.37292	0.14678	2.4	0.09	decrease
Str gf/tex	28.68	29.37	1.21747	0.25344	4.6	0.01	decrease significantly
Rd	77.33	77.51	0.05671	0.04767	1.1	0.45	decrease
+b	13.25	13.34	0.01842	0.00489	3.6	0.03	decrease significantly
	Raw	M+D	Raw	M+D			
Mic	4.32	4.27	0.00221	0.00049	4.3	0.02	decrease significantly
UHML mm	27.97	28.15	0.20347	0.01672	11.5	0.00	decrease significantly
UI %	80.94	80.36	0.37292	0.03378	10.5	0.00	decrease significantly
Str gf/tex	28.68	28.93	1.21747	0.18678	6.2	0.00	decrease significantly
Rd	77.33	77.67	0.05671	0.03122	1.7	0.20	decrease
+b	13.25	13.31	0.01842	0.00544	3.2	0.04	decrease significantly

1B: mixing and doubling

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Effect of machine on within-cotton variability: results

Mix larger samples (4 kg)

Exp. 2

F-ratio: raw:mixed *(inverted when in italic)*

if > 1 → variability tend to decrease *(to increase when in italic)*

the higher, the more effect of mixing

2A: mixing

Parameter	Mean		Variance		F ratio	Pr>F	Trend to
	Raw	M	Raw	M			
Mic	4.31	4.31	0.00234	0.00157	1.5	0.20	decrease
UHML mm	29.70	29.57	0.20706	0.18532	1.1	0.41	decrease
UI %	82.04	81.39	0.33311	0.74054	*2.2*	*0.04*	*increase*
Str gf/tex	33.11	33.78	0.86485	0.75136	1.2	0.38	decrease
Rd	79.39	79.68	0.04133	0.08167	*2.0*	*0.07*	*increase*
+b	11.54	11.52	0.05980	0.04802	1.2	0.32	decrease
	Raw	M+D	Raw	M+D			
Mic	4.31	4.30	0.00234	0.00123	1.9	0.09	decrease
UHML mm	29.70	29.52	0.20706	0.08164	2.5	0.02	decrease significantly
UI %	82.04	81.38	0.33311	0.17115	1.9	0.08	decrease
Str gf/tex	33.11	33.90	0.86485	0.50780	1.7	0.13	decrease
Rd	79.39	79.68	0.04133	0.01154	3.6	0.00	decrease significantly
+b	11.54	11.49	0.05980	0.01127	5.3	0.00	decrease significantly

2B: mixing and doubling

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Effect of machine on within-cotton variability: discussion

- The homogenizing machine enables a decrease in variability for the 6 CSITC criteria (UHML and Str) so the mixing effect can be considered as efficient.
- Mixing effect is more important for the procedure involving small samples.
- Additional doubling enables a greater decrease in variability, for both experiments involving small or larger quantities mixed.

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Plan of presentation

- Introduction
- Homogenizing machine description
- Effect of machine on mixed cottons
- **Effect of machine on homogenized cotton**
- Conclusion

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Homogenizing cotton with the machine

- Test in partnership with BBB
  - BCRT2008-4 and BCRT2009-4(H): same cotton
- Objective
  - BCRT2009-4: Homogenize large masses of cotton (50 kg) from one bale

    Procedure: machine+doubling described for Exp.2 (12 times)
  - Observe a difference of variability between material before and after homogenization

    H0: homogenizing machine reduces within-cotton variability

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Homogenizing cotton with the machine

- Materials
  - Cotton: West African Guinea Conakry (RM 40)
  - BCRT2009-4: Homogenizing machine
    - » Speed ratios fixed
    - » Distances between pairs of cylinders
    - » Pressure between cylinders
    - » Pressure drop in venturi
  - Internal experiment in one laboratory:
    - SITC testing: HVI 1000 M1000
    - 10 tests (1 Mic, 2 LS, 2 CT)

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Effect of machine on within-cotton variability: results and discussion

- Internal procedure to evaluate within-cotton variability

N(raw,2008) = 8
N(H,2009) = 10

F-ratio: raw:homogenized
if > 1 → variability decrease

	Mean		Variance		Ratio	Pr>F	Trend to
Parameter	**Raw**	**H**	**Raw**	**H**	**Var**		
Mic	3.34	3.44	0.003	0.000	7.0	0.00	decrease significantly
Str gf/tex	31.51	31.84	0.058	0.058	1.0	0.47	stable
UHML mm	28.93	28.57	0.062	0.011	5.9	0.01	decrease significantly
UI %	82.55	81.63	0.040	0.025	1.7	0.23	decrease
Rd	71.68	72.13	0.048	0.018	2.8	0.08	decrease significantly
+b	12.41	12.72	0.007	0.004	1.8	0.20	decrease

- Variability is reduced after homogenizing procedure → evaluation of the true inter-lab variability (due to laboratory practices, independently from cotton)

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Interpretation of inter-laboratory variability

- Complementary results (from RT):
  - Over 187 (2008-4) and 141 (2009-4) participating laboratories
  - Inter-lab variance results 2008-4 (Raw) and 2009-4 (H) :

Parameter	N		Mean		Variance		MD significant?	F Ratio	Trend to
	Raw	H	Raw	H	Raw	H			
Mic	74	74	3.40	3.43	0.011	0.007	no	1.6	decrease significantly
Str gf/tex	65	65	31.29	32.21	1.661	3.298	yes	*2.0*	*increase*
UHML mm	63	63	29.01	28.97	0.159	0.164	no	1.0	stable
UI %	59	59	82.57	82.34	0.324	0.457	no	*1.4*	*increase*
Rd	74	74	70.95	71.08	3.249	3.915	no	*1.2*	*increase*
+b	70	70	12.63	12.62	0.364	0.389	no	*1.1*	stable

F-ratios in italic: inverted from raw:H to H:raw in order to get F >1

→ Open to discussion

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Plan of presentation

Cotton Testing in Africa
CSITC - Project

- Introduction
- Homogenizing machine description
- Effect of machine on mixed cottons
- Effect of machine on homogenized cotton
- **Conclusion**

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Conclusion

The homogenizing machine ensures:

Very efficient for small quantities → Research samples

– a decrease in within-cotton variability while mean values remain unchanged (gentle process)

Applicable for CSITC RT in Africa

– when associated to an easy doubling process, sampling 4 kg of cotton fibre masses is easy before sending samples to participating labs

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Note

- Possibility to see the machine
  - + 1 machine at Faserinstitut Bremen, Germany
  - + 1 machine at RTC West (CERFITEX, Ségou, Mali)
  - + 1 machine at RTC East (TBS, Dar Es Salaam, Tanzania)
  - + 1 prototype at CIRAD, France

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  - CFC/ICAC/33 project
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More details in:

Plus de détails dans :

PAYET L., GOURLOT J-P., 2011, Rapport “D.2.2. Development of a prototype of homogenizing machine, and production of simplified copies for RTCs, Public information”, Project CFC/ICAC/33, 38 p.

Thanks for your attention