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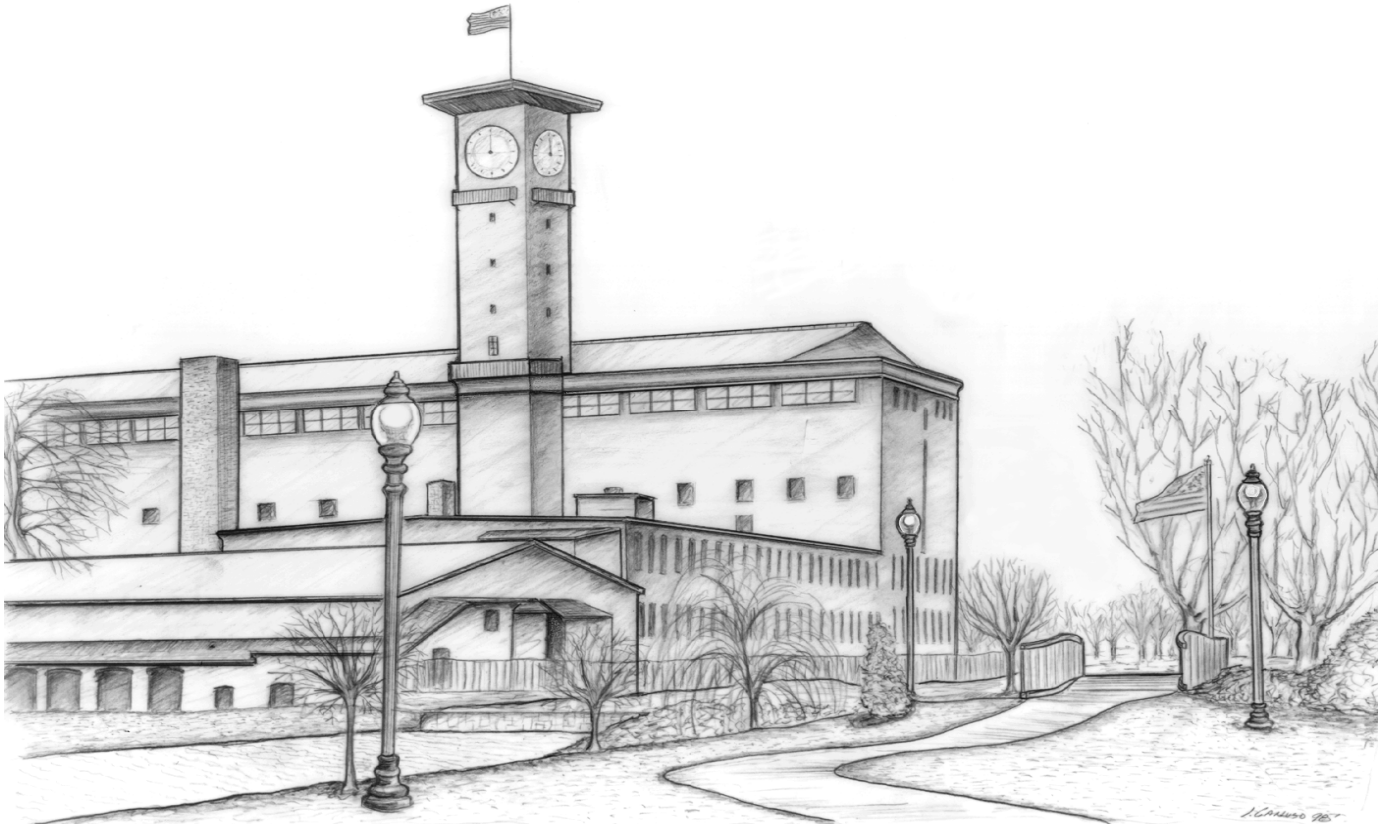

Machine Safety

Being Proactive Against Common Risk Analysis Findings

Machine Manufacturer or End User

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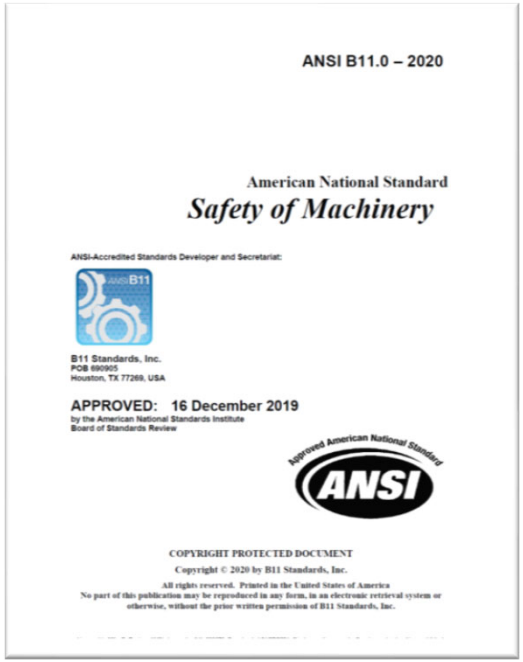
Being Proactive Against Common Risk Findings
Responsibilities

- **ANSI B11.0-2020 Safety of Machinery**
  - Section 4 Responsibilities
    - 4.1 General
      - The **supplier and the user** either separately or jointly shall identify hazards, assess risks and reduce risks to an acceptable level within the scope of their respective work activities as described in this standard


ANSI B11.0 – 2020

American National Standard

Safety of Machinery

ANSI-Accredited Standards Developer and Secretariat:

B11 Standards, Inc.
POB 690905
Houston, TX 77269, USA

APPROVED: 16 December 2019
by the American National Standards Institute
Board of Standards Review

Approved American National Standard
ANSI

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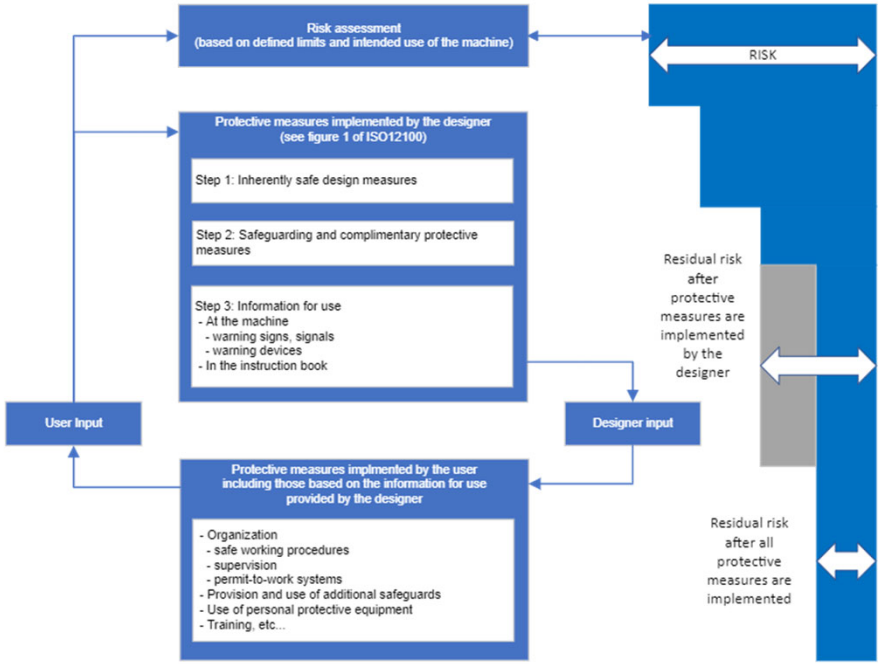
Being Proactive Against Common Risk Findings
Responsibilities

- **ANSI/ISO 12100:2012**
  - Safety of Machinery
    - General principles for design
      - Risk assessment and risk reduction
        - » Figure 2



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Being Proactive Against Common Risk Findings

Common Findings

- Knowledge of Tasks on a Machine
- Documentation
- Insufficient Guarding
- Bypassing of Guards
- Stop Time Measurements
- Safety Distance Calculations
- Machine Functionality
- Training
- Safety Controls

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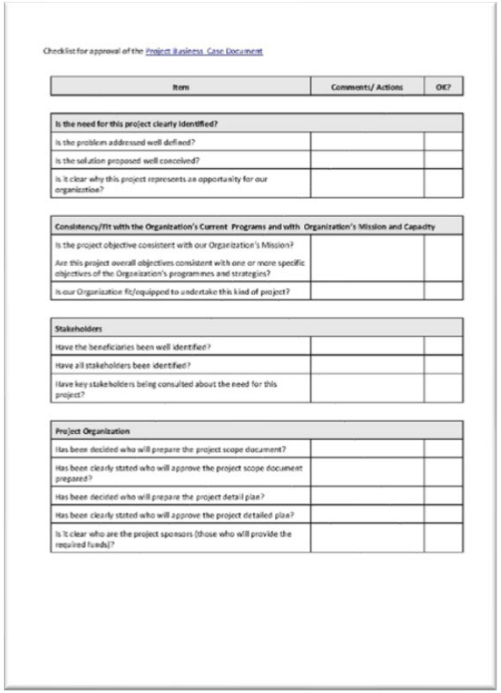
Being Proactive Against Common Risk Findings
Common Findings

- **Knowledge of Tasks on a Machine**
  - What does personnel do on the machine?
  - When is LOTO applied versus machine guarding?
  - Is it safe operation or has it become routine?



Checklist for approval of the Project Business Case Document

Item	Comments/ Actions	OK?
Is the need for this project clearly identified?		
Is the problem addressed well defined?		
Is the solution proposed well conceived?		
Is it clear why this project represents an opportunity for our organization?		
Consistency/Fit with the Organization's Current Programs and with Organization's Mission and Capacity		
Is the project objective consistent with our Organization's Mission?		
Are this project overall objectives consistent with one or more specific objectives of the Organization's programmes and strategies?		
Is our Organization fit/equipped to undertake this kind of project?		
Stakeholders		
Have the beneficiaries been well identified?		
Have all stakeholders been identified?		
Have key stakeholders being consulted about the need for this project?		
Project Organization		
Has been decided who will prepare the project scope document?		
Has been clearly stated who will approve the project scope document prepared?		
Has been decided who will prepare the project detail plan?		
Has been clearly stated who will approve the project detailed plan?		
Is it clear who are the project sponsors (those who will provide the required funds)?		

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Being Proactive Against Common Risk Findings
What Can Be Accomplished

- **Knowledge of Tasks on a Machine**
  - Document the tasks for the machine
    - Operators
    - Maintenance
    - Engineering
    - Quality
    - Etc.
  - Define normal, routine and repetitive for that machine
  - Determine which tasks are LOTO and which tasks are machine guarding
  - Determine if the tasks are being safely performed

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Being Proactive Against Common Risk Findings

Common Findings

- **Documentation**
  - Standard Operating Procedures
  - Work Instructions
  - LOTO Procedures
  - Schematics
  - Preventative Maintenance
  - Training Records

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Being Proactive Against Common Risk Findings

What Can Be Accomplished

- **Documentation**
  - Determine what documentation is existing and what is missing
  - Check to ensure existing documentation is up to date
  - Check that documentation reflects safe operation
  - Develop or obtain missing documentation
  - Check for preventative maintenance schedules and they are being completed
  - Authorized employees trained and training recorded

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Being Proactive Against Common Risk Findings
Common Findings

- **Insufficient Guarding**
  - Reaching around, through, over and under guarding
  - Modified guarding
  - Missing guarding
  - Guarding designed after functionality

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Being Proactive Against Common Risk Findings
What Can Be Accomplished

- **Insufficient Guarding**
  - Look around the machine; Can you reach a hazard area
  - Is there an operational reason for a hole in a guard
  - Design guarding with the function, not after
  - Replace/Repair missing guarding; get to root cause
  - DO ASK “Can Someone do that?” NOT “Why would someone do that?”
  - DO ASK “How does this function of the machine get performed safely?” NOT “How do I add safety to the machine after the function is designed?”

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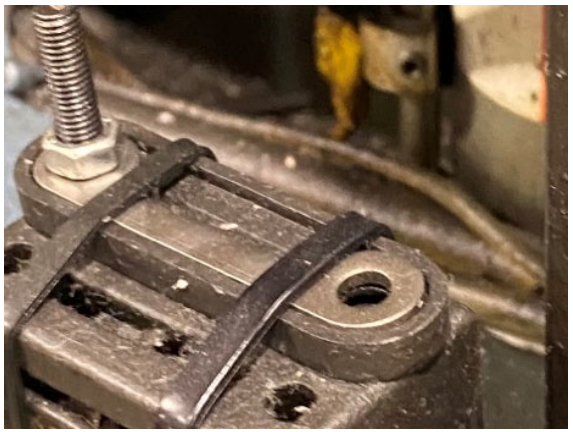
Being Proactive Against Common Risk Findings
Common Findings

- **Bypassing of Guards**
  - Override Switches
  - Actuators removed or unbolted
  - Need to get to root cause



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Being Proactive Against Common Risk Findings
What Can Be Accomplished

- **Bypassing of Guards**
  - Immediately address
    - Remove bypassing devices
    - Training
  - Determine a root cause; Why is this being bypassed
  - Change of culture

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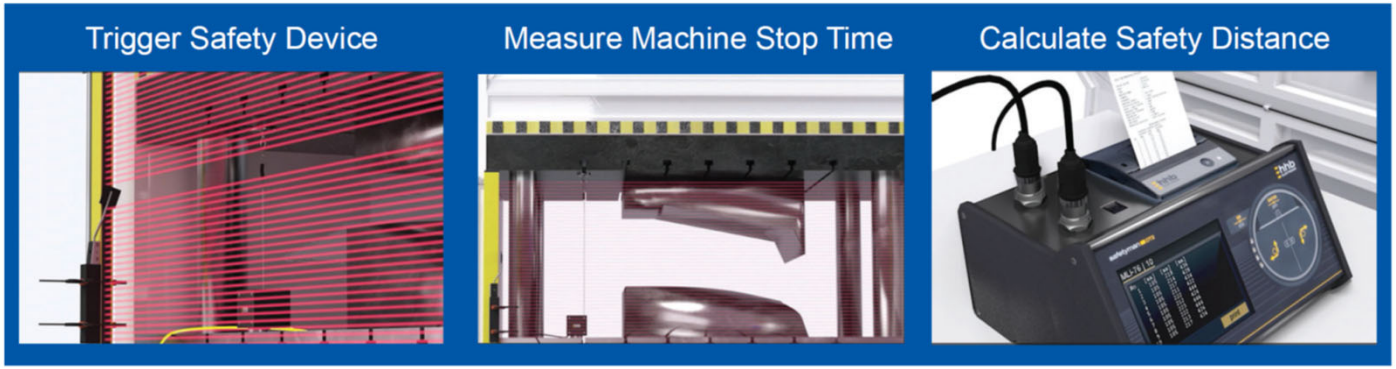
Being Proactive Against Common Risk Findings
Common Findings

- **Stop Time Measurements**
  - Rarely performed
  - How long does it take for the machine to enter a safe condition?
  - What is a safe distance?



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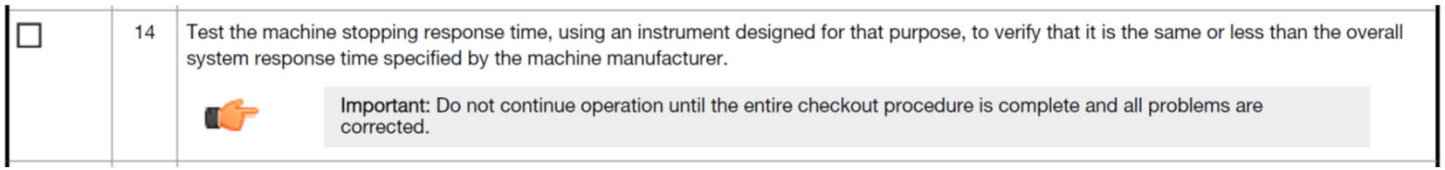
Being Proactive Against Common Risk Findings
What Can Be Accomplished

- **Stop Time Measurements**
  - Stop Time measurements should be performed on a routine schedule
  - Check recommendations from safety component manufacturers and industry standards
  - Understand the impact
  - Initial machine design may be able to be manually calculated, but should be measured for accuracy



☐	14	Test the machine stopping response time, using an instrument designed for that purpose, to verify that it is the same or less than the overall system response time specified by the machine manufacturer. **Important:** Do not continue operation until the entire checkout procedure is complete and all problems are corrected.

4. The total response time of the machine does not exceed the response time calculated during the first commissioning.

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Being Proactive Against Common Risk Findings
Common Findings

- **Safety Distance Calculations**
  - Were calculations performed based on stop time?
  - Safety devices mounted for convenience

Table H.1 – Safety distance equation for engineering controls – devices

$D = (K \times T) + d_{ds} + Z$		Equation (H.1)
Where:		**Reference:**
D [1] =	safety distance of a device	H.2
K =	maximum speed that an individual can approach the hazard	H.3
T =	total time to achieve a safe condition	H.4 and Annexes J, K and L
d_{ds} =	Reaching distance associated with devices	H.5 and Annex I
Z =	supplemental distance factor(s)	H.6
1	As required by 10.7.1.2, $D \geq 100$ mm (3.94") for presence-sensing device installations in which the direction of approach is perpendicular to the sensing field (i.e., normal approach).	

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Being Proactive Against Common Risk Findings
What Can Be Accomplished

- **Safety Distance Calculations**
  - How do you perform without a stop time measurement?
  - Determine which formulas need to be used as well as which standards are going to be utilized for guidance
  - Perform the calculation and add to the documentation
  - Check to ensure safety devices are mounted properly
    - Adjust distance of safety device if needed
    - Check for new reaching gaps created by the adjustment
    - Fill in open areas to prevent reach in

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Being Proactive Against Common Risk Findings
Common Findings

- **Machine Functionality**
  - Understanding the safety functions
  - How does the machine enter a safe condition
  - What actually shuts down or does not? Why?





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Being Proactive Against Common Risk Findings
Common Findings

- **Machine Functionality**
  - Too easy to say this is how the machine works
    - What is the purpose of the machine
    - Determine that it is functioning as designed
    - Find out what the machine is doing inside not just what is going in and out
  - Understand the safety functions of the machine and document them
    - What does the e-stop do? Guard door do? Other?
    - What actually is put into a safe condition
    - What is de-energized
    - What can still move and why

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Being Proactive Against Common Risk Findings
Common Findings

- **Training**
  - What standards applies
  - Machine operation

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Being Proactive Against Common Risk Findings

What Can Be Accomplished

- **Training**
  - Both machine builder and end-user need to be trained on applicable standards for machine safety
  - Put into place a training program that fits the different personnel and their tasks associated with the machine

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Being Proactive Against Common Risk Findings
Common Findings

- **Safety Controls**
  - What levels are needed
  - What levels are existing
  - How do you determine the current architecture

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Being Proactive Against Common Risk Findings
What Can Be Accomplished

- **Safety Controls**
  - Learn what is a proper safety device
  - Check for proper safety devices and ratings
  - Review Schematics
  - Plan on what safety functions need to be corrected or added

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Being Proactive Against Common Risk Findings

What Are The Next Steps

- **Summary**
  - No finger pointing – Move forward – Take responsibility
  - Get to know the machine – How does it work – How does personnel interact
  - Document and understand the tasks from all personnel
  - Document clear boundaries for LOTO and machine guarding
  - Review existing documentation and replace missing documentation
  - Modify documentation to promote safe operation
  - Design safety in with function from the start of the initial machine concept
  - Evaluate existing guarding – Proper safety devices – No Bypassing
  - Get to the root cause of issues

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Being Proactive Against Common Risk Findings
What Are The Next Steps

- **Summary**
  - Perform stop time measurements – calculate safety distances
  - Dig deeper into safety functions – Understand what and how is put into a safe condition
  - Institute a training program for operations, machine safety, etc.
  - Determine current safety architecture and compare to what is needed

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Thank you for your attention!

Questions?

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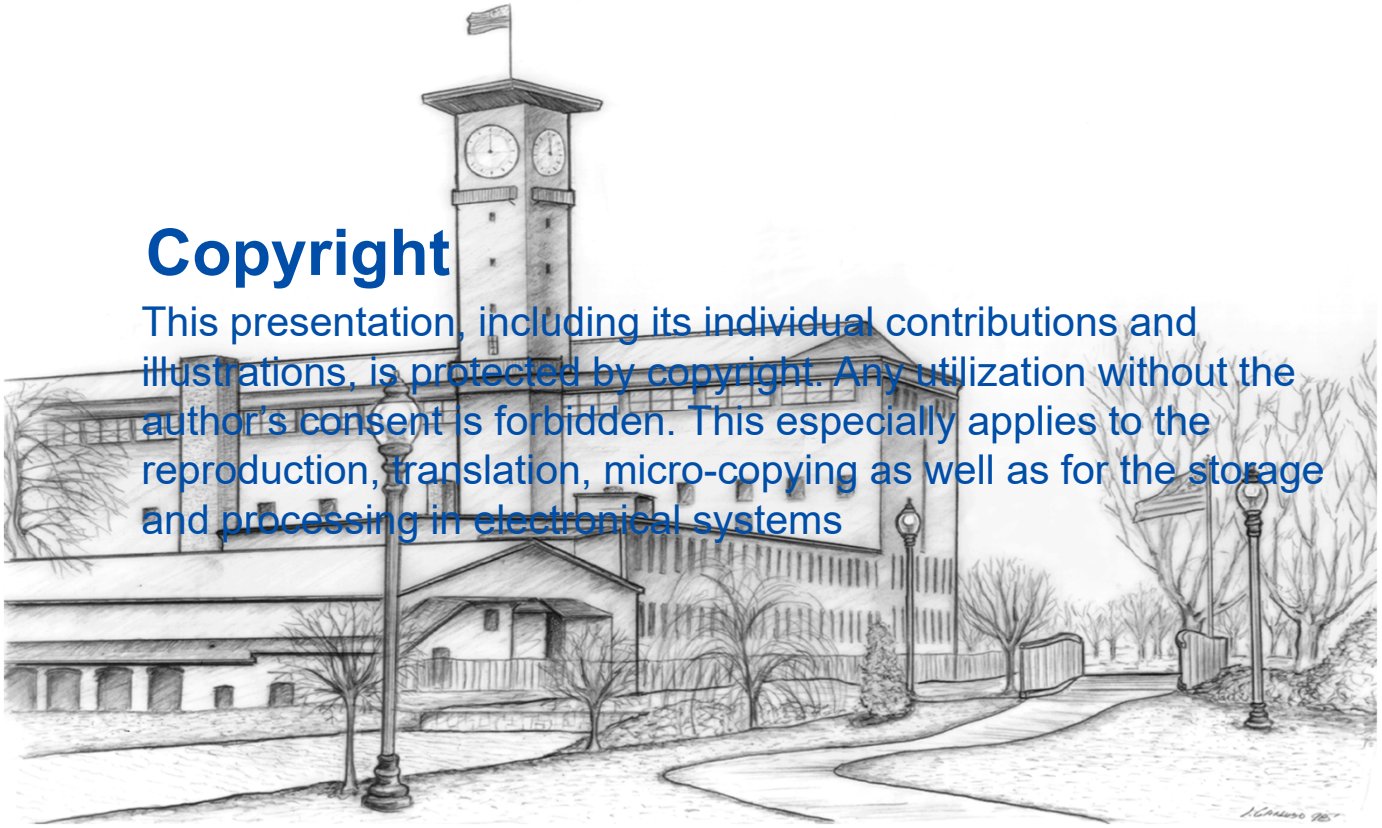

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