

Database for documenting hazard and risk assessment at the National Institute for Standards and Technology (NIST) in the Materials Measurement Laboratory

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Non-regulatory agency of Dept. of Commerce

Mission: To promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life.



Other MML Work Locations: Hollings Marine Lab (SC), Brookhaven National Lab (NY); Institute for Biosciences and Biotech Research (MD); Stanford University (CA)

NIST (3000 employees, 2500 associate researchers):

Innovation and Industry Services

Laboratory Programs

- Center for Neutron Research
- Center for Nanoscale Sciences
- Communications Technology
- Engineering Lab
- Information Technology
- [Material Measurement \(925-975 staff/assoc.\)](#)
- Physical Measurement

Management Resources (including Safety)

Material Measurement Laboratory (MML) Subject Areas

Advanced Materials
Biomedical and Health
Chemistry
Electronics
Energy
Environment/Climate
Food Safety and Nutrition
Manufacturing
Measurement Standards
Nanotechnology
Physical Infrastructure
Radioactivity
Safety, Security and Forensics
Standard Reference Materials
Transportation

MML Physical Work Environments

Laboratories:
Chemistry
Biology
Laser
Mechanical testing
Clean Rooms

Field Work

Shops
Neutron Facilities
X-ray beams
Synchrotrons
Large scale material prep
Warehousing



Safety Management System Core: Hazard Analysis and Control

Hazard: **Potential for harm** associated with a **condition or activity that if left uncontrolled can result in injury, illness** or damage to the property or environment.

Hazard Analysis: Any of a variety of techniques **that focuses on job tasks as a way to identify hazards before they occur...** focusing **on the relationship between the worker, the task, the tools and work environment**

From OSHA Job Hazard Analysis

Job Hazard Analysis

OSHA 3071
2002 (Revised)



OSHA Occupational
Safety and Health
Administration
U.S. Department of Labor

MML Task: Develop a database for hazard review and approval

Requirements

- Meet NIST Safety requirements
- Eliminate paper
- Adequate for all types of work
- Web-based to allow access at all work locations
- Ease of use – logical work flow
- Ability to copy or clone hazard reviews and modify for similar work
- Electronic routing for review and approval and notifications
- Maintain approved user list
- Database functionality for searching
- Ability to create reports
 - Locations
 - People
 - Hazard types
 - Controls
 - Other

Hazard Review Control Number: 831.209 5/25/10
 CSTL Experimental Procedure Safety Review Part A (Section 1 of 2)
 Hazard Identification and Assessment - General Information
 (to be filled out by the Principal Investigator, et al.)

Name of Experiment/Process: Bacterial culture maintenance
 Principal Investigator: Jayne Morrow, Sandra Da Silva

Location of Experiment: Bldg./Room: 227/A162
 Approximate times this experiment will be repeated: 1-2 3-10 Sole-Use Lab Multi-Use Indefinite

Principal Equipment/Apparatus to be Used:

- 1 NuAire Biological Safety Cabinet
- 2 Olympus Microscope with Prior Automated Scanning Stage
- 3 Vortexer
- 4 Sonicator
- 5 Autoclave
- 6 Chemical fume hood
- 7
- 8

Experimental Temperature Range: room temperature Pressure Range: atmospheric

Principal Chemicals, Gases, Biologicals, etc. to be Used:

Substance	Quantity	Flammable	Toxic	Reactive	Acid/Corrosive	Carcinogenic or Mutagenic	Radioactive	Biological (BioSafety Level 2)	Cryogenic	Nano-particles
1 Bacillus anthracis Sterne Spores	5 ml					No	No	Yes	No	No
2 Pseudomonas aeruginosa PAO1	5 ml					No	No	Yes	No	No
3 Escherichia coli	5 ml					No	No	No	No	No
4 Bacillus cereus	5 ml					No	No	No	No	No
5 Kanamycin sulfate	5 grams	Slight	Moderate			No	No	No	No	No
6 Ampicillin sodium salt	5 grams	Slight	Moderate			No	No	No	No	No
7 Carbenicillin disodium salt	250 mg	Slight	Moderate			No	No	No	No	No
8 95 % ethanol	1 gallon	Severe				No	No	No	No	No
9 Sodium hypochlorite (6%)	1 gallon		Severe	Slight	Moderate	No	No	No	No	No
10 LB (Luria-Bertani) Miller agar	500 grams	Slight				No	No	No	No	No
11 phosphate buffered saline (PBS)	1 L					No	No	No	No	No
12 Potassium dibasic phosphate	500 grams		Moderate			No	No	No	No	No
13 Monopotassium phosphate	500 grams					No	No	No	No	No
14 Ammonium sulfate	500 grams		Severe			No	No	No	No	No
15 Magnesium sulfate heptahydrate	500 grams					No	No	No	No	No
16 Ferric chloride hexahydrate	500 grams		Severe	Moderate		No	No	No	No	No
17 D-glucose	500 grams	Slight				No	No	No	No	No
18 magnesium chloride hexahydrate	500 grams		Moderate			No	No	No	No	No
19 EDTA disodium salt	250 grams	Slight	Moderate			No	No	No	No	No

Page 1 of 8 of the 2010 form. This replaced a 1993, 2-p form

NIST Requirements: Job Hazard Analysis tied to Risk Assessment

1. Fully describe activity
 1. Define **activity boundaries** (e.g., voltage, **T, P, quantity limits**, etc. if necessary)
 2. Define subtasks or **steps** of the activity that present hazards and identify the **hazards**; i.e., perform a Job Safety Analysis (JSA)
 3. Identify **hazardous substances** used and **hazardous wastes** generated
 4. Identify **key stages** of activity for hazards (i.e., set-up, maintenance, replenishment, etc.)
2. Specify **physical locations** and review suitability of physical location for proposed work
3. Compatibility assessment (with other work performed in the area)
4. Specify **procedures**, e.g., SOPs, job instructions, equipment manuals, etc.
5. Reference or attach supporting **documents** including: exposure assessments, ODH calculations, biohazard forms, radioactive material approvals, etc., as applicable
6. Mitigate hazards; use hierarchy of **controls** (elimination, substitution, **engineering, administrative, PPE**)
7. Confirm controls are in place or will be in place when work commences
8. Include an **incident response plan** (how to handle emergency or off-normal conditions)
9. Use **RHI Matrix to determine risk** (**severity** and **likelihood**); associate RHI value with each controlled hazard,
- 10. Flag: LOTO, confined space, hearing protection, respirators, fall protection, exposure assessments**
11. Ability to notify other managers of hazards that may impact their operations
12. Include PPE certification– attest that hazards were evaluated and PPE selected accordingly
- 13. Approve** hazard review
- 14. Authorize** work
- 15. Authorize** workers

Items in **red**: data fields
Items in **blue**: functions

NIST Requirements for Risk Assessment, Work and Worker Approval

		POTENTIAL SEVERITY OF HAZARD			
		Catastrophic Death or permanent disability System or facility loss Lasting environmental or public health impact	Severe Serious injury; temporary disability Subsystem loss or facility damage Temporary environmental or public health impact	Moderate Medical treatment; lost-work-day(s) Minor facility damage External reporting/cleanup requirements	Minor First-aid only Negligible or slight damage Routine cleanup
LIKELIHOOD OF OCCURRENCE	Frequent Likely to occur repeatedly	CRITICAL RHI=4	CRITICAL RHI=4	SERIOUS RHI=3	Medium RHI=2
	Probable Likely to occur multiple but infrequent times	CRITICAL RHI=4	CRITICAL RHI=4	SERIOUS RHI=3	Medium RHI=2
	Occasional Likely to occur at some time	CRITICAL RHI=4	SERIOUS RHI=3	Medium RHI=2	Low RHI=1
	Remote Possible, but not likely to occur	SERIOUS RHI=3	Medium RHI=2	Medium RHI=2	Low RHI=1
	Improbable Very unlikely; can reasonably assume it will not occur	Medium RHI=2	Low RHI=1	Low RHI=1	Minimal RHI=0

Every step of the work activity is evaluated, hazards identified, mitigated and the risk is assessed for each step (RHI value)

The overall activity RHI = the highest risk step in the activity

Hazard review and work approval is tied to the activity risk level:

- RHI=0,1: 1st level supervisor
- RHI=2 : 1st and 2nd level supervisor and safety rep
- RHI=3 1st and 2nd level supervisor, safety rep, committee of experts, Lab Director
- RHI=4 work is not permitted

Workers approved by 1st level supervisor based on successful completion of required training

Lab contacts are notified

MML: Out of hours works for high hazard activities approved by 2nd level supervisor

Leveraged an existing database that contained people and their roles.

Evolution of Database Requirements

Generate hazard and PPE icons and NFPA summary

Use drop-down menus wherever possible

- People
- Locations
- Material properties and storage requirements
- Hazard types
- Stage of operation of potential exposure
- Controls in order of the hierarchy, include list of PPE
- Severity and likelihood selections

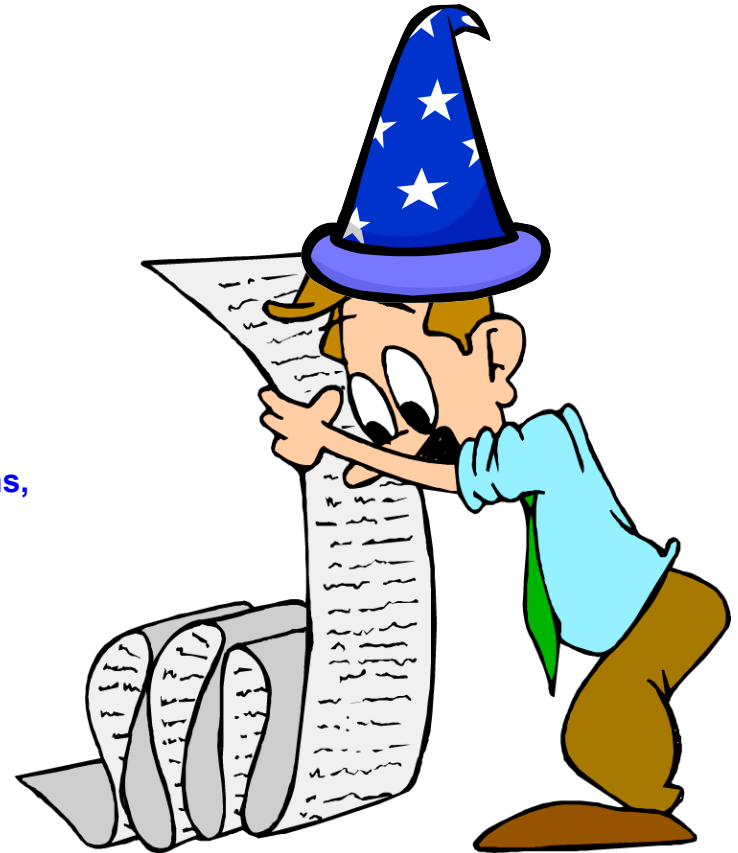
Develop review questionnaire to cover requirements, track rejections, comments and approvals

- Completeness, accuracy, etc.
- Space review
- Compatibility with other activities
- PPE attestation
- Notify other managers if work could affect them
- Verify controls are in place and functional

Electronic routing for approval according to RHI value

- Email to P.I. at each step
- Allow **revisions** to rejected reviews, **resubmission**
- Reminder emails** to managers when approvals are pending

Ability to add users and delete users to approved activities (without having to reapprove the activity)



Items in **blue**: functions

Hazard Review and Approval System

Material Measurement Laboratory

> Hazard Review and Approval System




Welcome to the Hazard Review and Approval System!

It is MML Policy to conduct hazard assessments for laboratory and shop work activities, to implement controls that mitigate hazards to an acceptable level of risk, and for line management to review and approve the hazard assessment and controls prior to commencement of the work.

Get Started
Create an activity


The system currently contains 2284 activities, of which 1870 have been approved. 645 principal investigators have activities in the system. MML(63) has 1049 activities (894 approved) entered by 311 investigators, with 49 activities ready for approval.

**Step 1:
Define Activity**




Create a hazard review package to describe a work activity (job, task, experiment, or lab or shop)

**Step 2:
Assess Hazards**



Assess the hazards, propose controls, and determine the risk hazard index

**Step 3:
Submit for Review**



Route the hazard review package for approval by safety representatives and line management

> Activities

 Create an Activity for Hazard Review

 Search Activities

	New	Active Revision	Under Review	Approved	All
My Activities (Imackey)	1	0	0	4	5
Additional Editor (Imackey)	1	0	0	5	6
Authorized For (Imackey)	0	0	0	0	0
Group 630.01	1	0	0	4	5
Division 630	4	0	0	19	23

> Reviews and Approvals

 View My Pending Action List

> Reports

> Instructions

- Online System Training
- Guide - Create Review
- Guide - Reviewers
- Guide - Authorize Users
- Training Slides
- Instruction Manual

> References

- FAQs
- Hazard Definitions
- Guidance for Reviewers
- Risk Hazard Index Matrix
- RHI Matrix Terms
- MML SOP Template
- Glove Selection Guide
- MML Hazard Review Policy
- Boulder Hazard Review Policy
- Definitions
- Technical Reference

> Links

- CISPRO
- ChemWatch MSDS
- NIST Org
- OSHE Programs
- NIST HSI's
- MML Safety
- Safety Contacts

Get Started
Create an activity



> New Activity

Title of Experiment / Name of Laboratory:	<input type="text"/>
Status:	New
Principal Investigator:	Elizabeth A. Mackey

[Cancel](#) [Create Activity](#)



> Edit Activity Description

1 **Edit Description/Documentation**
Edit Tasks/Equipment
Edit Principal Substances
Edit Waste Products

2 **Hazard Assessment**

3 **Submit For Review**

[View Activity \(Detailed\)](#) [View My Activities](#)
[View Activity \(Summary\)](#) [Search Activities](#)

Instructions

In the form below, you are able to enter the following information about the activity:

- Edit the activity description
- Associate rooms in which the activity will occur
- Add editors to help describe the activity and assess the hazards (optional)
- Describe principal substances, wastes, and tasks/equipment associated with the activity

[Save Activity](#)

Click **Get Started** and add title. Three step process– describe work , assess hazards, and submit for review

Description & Documentation | Tasks/Equipment | Principal Substances | Waste Products

General Information

Title of Activity / Name of Laboratory

ID: 630.01.0675.031116i
Status: New
Principal Investigator: Elizabeth A. Mackey
Additional Editors:
 Allow Access

Activity frequency
 Single Use
 Limited Duration
 Indefinite Use
Times Repeated (if other than Single)

Activity Description

Specify Activity Location

(Select building and room from the form below)

/ **Add Room**

Page 1. Tab 1. Part one: enter activity frequency, editors if you want to work collaboratively, activity description, and locations (multiple locations are permitted)

Documentation


(Upload only the documents that apply to this activity. Not all document types below will apply.)

Biohazard Registration	-		-	-	Click Icon to add
Design Plan	-		-	-	Click Icon to add
Energized Electrical Work Permit	-		-	-	Click Icon to add
Exposure Assessment	-		-	-	Click Icon to add
Incident/Emergency Response Plan	-		-	-	Click Icon to add
Instrument Manual	-		-	-	Click Icon to add
Laser Set-up Assessment	-		-	-	Click Icon to add
Lock-out Tag Out/Energy Control Procedure	-		-	-	Click Icon to add
Oxygen Deficiency Calculation	-		-	-	Click Icon to add
Radioactive Material (Safety Evaluation or NIST 364/5, BL100/101)	-		-	-	Click Icon to add
Safe Operating Procedure	-		-	-	Click Icon to add
Safety Data Sheet (previously MSDS)	-		-	-	Click Icon to add
Standard Operating Procedure	-		-	-	Click Icon to add
Other	-		-	-	Click Icon to add

For any documentation that is only available in hard copy, enter the title of the document/manual and its location.

Incident/Emergency Response Plan Location

Specify file that contains the Incident/Emergency Response Plan, or select Activity Description and include I/ERP there.
Additional options will appear in the dropdown list as documents are added to the list above.

Indicate Location of I/ERP 

[Save Activity](#)

Page 1. Tab 1. Part two: upload applicable documents, or specify location of documents only available in hard copy. If users work radioactive material or biohazards they must upload the forms that indicate permission. Response plan required.

Description & Documentation		Tasks/Equipment	Principal Substances	Waste Products
Record below any jobs, tasks, steps being performed, or any equipment needed for this activity, click the "Add process" link to add additional lines.				
Tasks/Equipment	Signage Required	Temperature Range	Pressure Range	Add/Rem
Distillation apparatus	biohazard Compressed Gas Cylinder Storage Area corrosive Crane explosion_risk	250 C	ambient	Delete
Heating mantle	flammable Forklift Hazmat Work Area High Voltage hot_surface	400 C	ambient	Delete
centrifuge	Laser LOTO - Lockout Tagout Low Ceiling low_temperature Magnetic			Delete
weigh out fresh biological samples	No Metal Implants No Metal or Watches No Pacemakers Non Ionizing Radiation Oxygen Depletion			Delete
Freeze-dry samples	Oxygen Depletion Permit Required Confined Space Toxic Gas toxic X-Rays			Add process

Page 1. Tab 2. List equipment and steps in the task, applicable signage requirements, pressure and temperature ranges (these fields are not required)

Description & Documentation		Tasks/Equipment	Principal Substances	Waste Products									
Enter the principal chemicals or other supplies in the list below, click the "Add principal" link to add additional lines.													
Principal Substance	Quantity	Units	Health	Flammable	Reactive	Carcinogenic / Mutagenic	Radioactive	Biological (BSL)	Cryogenic	Nanomaterials	Acid / Corrosive	Storage Required	Add/Rem
Ethanol	1	L	Moderate (2)	Severe (3)	None (0)	False	False	False	False	False	False	Flamm	
Nitric Acid	1	L	Severe (3)	None (0)	Moderate (2)	False	False	False	False	False	True	Acid	
biological samples	100	g	None (0)	None (0)	None (0)	False	False	True	False	False	False	Biohaz	
carbon nanotubes			None (0)	None (0)	None (0)	False	False	False	False	True	False	Nano	
			None (0)	None (0)	None (0)	False	False	False	False	False	False	N/A	

- N/A
- Acid
- Base
- Biohazard
- Explosives locker
- Flammable
- Freezer
- Gas Cabinet
- Inert Atmosphere
- Locked Cabinet
- Nano
- RAM
- Refrigeration

Page 1. Tabs 3 and 4. List substances and quantities handled. Select from drop-down menus: NFPA values, flag: carcinogens, biohazards, cryogens, nano-materials, acids/corrosives, specific storage requirements.

Source	Hazard	Severity	Stage	Applied/Planned Controls	Likelihood of Incident w/ applied controls	Controlled RHI	Add/Rem
Distillation apparatus	Chemical (Flammable)	Severe	Normal Operations	Ventilation, Use of Fume Hood, Operating Procedures, Other (Please Specify) (Trained by P.I.), Gloves (specify type or types), Lab Coat, Safety Goggles Select Controls	Remote	2 - Medium	Delete Copy
Freeze-dry samples	Biologicals	Moderate	Set-up and/or Tear Down	Biosafety Cabinet Use, Operating Procedures, Biosafety (Biennial Refresher Required), Bloodborne Pathogens (Annual Refresher Required), Dust mask (Voluntary Use), Gloves (specify type or types), Lab Coat, Safety Glasses with side shields Select Controls	Occasional	2 - Medium	Delete Copy
Heating mantle	Temperature Extreme Heat	Moderate	Set-up and/or Tear Down	Gloves (specify type or types) (insulated), Lab Coat Select Controls	Occasional	2 - Medium	Delete Copy
centrifuge	Mechanical Failure	Severe	Normal Operations	Select Controls	Occasional	3 - Serious	Delete Copy
weigh out fresh biological samples	Biologicals	Moderate	Normal Operations	Select Controls	Frequent	3 - Serious	Delete Copy
Ethanol	Chemical (Flammable)	Minor	Normal Operations	Select Controls	Probable	2 - Medium	Delete Copy
Nitric Acid	Chemical (Corrosive)	Catastrophic	Normal Operations	Select Controls	Frequent	4 - Critical	Delete Copy



Prepopulated with task equipment and steps, and substances listed

PAGE 2. Hazard Assessment Identify hazards → Estimate Severity → Enter stage of operations → Add controls → Estimate Likelihood of exposure with controls in place. System displays Risk Hazard Index

Source	Hazard	Severity	Stage	Applied/Planned Controls	Likelihood of Incident w/ applied controls	Controlled RHI	Add/Rem
Distillation apparatus	Chemical (Flammable)	Severe	Normal Operations	Ventilation, Use of Fume Hood, Operating Procedures, Other (Please Specify) (Trained by P.I.), Gloves (specify type or types), Lab Coat, Safety Goggles	Remote	2 - Medium	Delete Copy
	<ul style="list-style-type: none"> ✓ None Asphyxiation/Oxygen displacement Biologicals Chemical (Carcinogen) Chemical (Corrosive) Chemical (Flammable) Chemical (Teratogen) Chemical (Toxic) Dispersible Engineered Nanomaterial Dust/Particles (Respiratory Irritant) Electrical (Fire) Electrical (Loss of Power) Electrical (Shock/Short-Circuit) Electrical (Static/ESD) Ergonomics (Human Factor) Ergonomics (Strain) Excavation (Collapse) Explosion (Chemical Reaction) Explosion (Over Pressurization) Fall (Slip, Trip) Fire/Heat Mechanical Mechanical Failure Mechanical/Vibration (Chaffing/Fatigue) Noise Radiation (Ionizing) Radiation (Non-Ionizing) Struck Against Struck By (Mass Acceleration) Temperature Extreme Cold Temperature Extreme Heat Visibility Weather Phenomena (Snow/Rain/Wind/Ice) Other (specify in documentation) 	<ul style="list-style-type: none"> ✓ None Minor Moderate Severe Catastrophic 	<ul style="list-style-type: none"> ✓ None Set-up and/or tear-down Replenishment operations Normal operations Maintenance operations Multiple stages Other 	<ul style="list-style-type: none"> Select Controls Biological Safety Cabinet Use, Operating Procedures, Biosafety (Annual Refresher Required), (airborne Pathogens (Annual Refresher Required), Dust mask (Voluntary Use), Gloves (specify type or types), Lab Coat, Safety Glasses with side shields Select Controls 	Occasional	2 - Medium	Delete Copy
Freeze-dry samples	Chemical (Toxic)	Moderate	Set-up and/or Tear Down	Refreshers (Voluntary Use), Gloves (specify type or types), Lab Coat, Safety Glasses with side shields	Occasional	2 - Medium	Delete Copy
Heating mantle	Electrical (Static/ESD)	Moderate	Set-up and/or Tear Down	Gloves (specify type or types) (insulated), Lab Coat	Occasional	2 - Medium	Delete Copy
centrifuge	Explosion (Over Pressurization)	Severe	Normal Operations	Select Controls	Occasional	3 - Serious	Delete Copy
weigh out fresh biological samples	Fall (Slip, Trip)	Moderate	Normal Operations	Select Controls	Frequent	3 - Serious	Delete Copy
Ethanol	Mechanical Failure	Minor	Normal Operations	Select Controls	Probable	2 - Medium	Delete Copy
Nitric Acid	Mechanical/Vibration (Chaffing/Fatigue)	Catastrophic	Normal Operations	Select Controls	Frequent	4 - Critical	Delete Copy

PAGE 2. Identify hazards → Estimate Severity → Specific stage of operation for possible exposure/incident

Select the controls below which apply to the
Return to form without updating controls

Click the following link for additional instruction on [Glove Selection Options](#)

Source	Control Category	Control	Likelihood of Incident w/ applied controls	Controlled RHI	Add/Rem
Distillation apparatus	Built-in Engineering Control	<input type="checkbox"/> Enclosure/Isolation	√ None Frequent Probable Occasional Remote Improbable	2 - Medium	Delete Copy
	Built-in Engineering Control	<input type="checkbox"/> Ergonomic design			
	Built-in Engineering Control	<input type="checkbox"/> Guard/Barrier			
	Built-in Engineering Control	<input type="checkbox"/> Interlock/Auto-shutoff			
	Built-in Engineering Control	<input type="checkbox"/> Other Engineering Controls (Please Specify)			
	Built-in Engineering Control	<input type="checkbox"/> Ventilation			
Freeze-dry samples	Applied Engineering Control	<input type="checkbox"/> Biosafety Cabinet Use	Occasional	2 - Medium	Delete Copy
	Applied Engineering Control	<input type="checkbox"/> Glove Box (Specify Atmosphere)			
	Applied Engineering Control	<input type="checkbox"/> Nanomaterial Ventilated Enclosure			
	Applied Engineering Control	<input type="checkbox"/> Other Device Use (Please Specify)			
	Applied Engineering Control	<input type="checkbox"/> Use of Fume Hood			
	Applied Engineering Control	<input type="checkbox"/> Work Behind Shielding			
Heating mantle	Administrative	<input type="checkbox"/> Alarms	Occasional	2 - Medium	Delete Copy
	Administrative	<input type="checkbox"/> Buddy System			
centrifuge	Administrative	<input type="checkbox"/> Industrial Hygiene practices			
weigh out fresh biological samples	Administrative	<input type="checkbox"/> Lock-out Tag-out Procedure			
Ethanol	Administrative	<input type="checkbox"/> Operating Procedures			
Nitric Acid	Administrative	<input type="checkbox"/> Permit-required Confined Space Entry Procedure			
	Administrative	<input type="checkbox"/> Safe Practices	Occasional	3 - Serious	Delete Copy
	Administrative	<input type="checkbox"/> Signs/Labels/Warning			
	Administrative	<input type="checkbox"/> Time Limitations			
	Administrative	<input type="checkbox"/> Use Monitoring			
	Administrative	<input type="checkbox"/> Work Permits			
	Administrative	<input type="checkbox"/> Other PPE (Please Specify)			
	Administrative	<input type="checkbox"/> Respirators (Required Use; specify type)	Frequent	3 - Serious	Delete Copy
	Administrative	<input type="checkbox"/> Respirators (Voluntary Use; specify type)			
	Administrative	<input type="checkbox"/> Safety Glasses with side shields			
	Administrative	<input type="checkbox"/> Safety Goggles			
	Administrative	<input type="checkbox"/> Hearing Protection (Required Use)			
	Administrative	<input type="checkbox"/> Hearing Protection (Voluntary Use)			
	Administrative	<input type="checkbox"/> High Visibility Clothing	Probable	2 - Medium	Delete Copy
	Administrative	<input type="checkbox"/> Lab Coat			
	Administrative	<input type="checkbox"/> Laser Safety Glasses			
	Administrative	<input type="checkbox"/> Other PPE (Please Specify)			
	Administrative	<input type="checkbox"/> Respirators (Required Use; specify type)			
	Administrative	<input type="checkbox"/> Respirators (Voluntary Use; specify type)			
	Administrative	<input type="checkbox"/> Safety Glasses with side shields	Frequent	4 - Critical	Delete Copy
	Administrative	<input type="checkbox"/> Safety Goggles			
	Administrative	<input type="checkbox"/> Dust mask (Required Use)			
	Administrative	<input type="checkbox"/> Dust mask (Voluntary Use)			
	Administrative	<input type="checkbox"/> Face Shield			
	Administrative	<input type="checkbox"/> Fall Protection			
	Administrative	<input type="checkbox"/> Foot Protection			
	Administrative	<input type="checkbox"/> Gloves (specify type or types)			
	Administrative	<input type="checkbox"/> Head Protection			
	Administrative	<input type="checkbox"/> Hearing Protection (Required Use)			
	Administrative	<input type="checkbox"/> Hearing Protection (Voluntary Use)			
	Administrative	<input type="checkbox"/> High Visibility Clothing			
	Administrative	<input type="checkbox"/> Lab Coat			
	Administrative	<input type="checkbox"/> Laser Safety Glasses			
	Administrative	<input type="checkbox"/> Other PPE (Please Specify)			
	Administrative	<input type="checkbox"/> Respirators (Required Use; specify type)			
	Administrative	<input type="checkbox"/> Respirators (Voluntary Use; specify type)			
	Administrative	<input type="checkbox"/> Safety Glasses with side shields			
	Administrative	<input type="checkbox"/> Safety Goggles			

Update Controls

PAGE 2. Continued-- Add controls → Estimate Likelihood. The system calculates the Risk Hazard Index value

> Hazard Assessment

1 Edit Description/Documentation
Edit Tasks/Equipment
Edit Principal Substances
Edit Waste Products


2 Hazard Assessment

3 Submit For Review

View Activity (Detailed)
View Activity (Summary)

View My Ac
Search Acti

Activity:	630.01.0225.032613i - Microwave Methacrylation of PEG (clone of 630.01.0225.032613i)
Parameters:	Activity Frequency: Indefinite Use
Experiment description:	Copied from 630.00.0011.102711i Dry 3 g PEG overnight in vacuum oven; for instructions to purge with Ar(g) for 1 min. In a fume hood, add 8%±0.5 g hydrate to 100 mL of diethyl ether in a 250 mL beaker. Stir for 10 min, using rubber septum to seal. Then remove septum and add 0.855 mL of 10% methacrylonitrile solution to the beaker. Stir for 10 min inside small beaker to handle, etc..
Storage required:	diethyl ether -- Flammable mixed organic liquids -- Flammable
History:	Created: Elizabeth A. Mackey, 2013-03-26 14:53:06 UTC

 **From "https://spica.nist.gov":**

This will officially submit review 630.01.0225.032613i 'Microwave Methacrylation of PEG (clone of 630.00.0011.102711i)' for group leader review. After this point, you will no longer be able to make changes to the description, supplies, or hazards.

Do you wish to submit this activity for review?

Cancel OK

> Pre-Review Checklist

Hazards Appropriately Defined	✓
ERP Location Not Defined	✗
Missing Biohazard Registration Form	✗
Radiation Documents not required	✓
No locations have been assigned for this activity	✗
Ergonomics (Human Factor) for methacrylic anhydride has no controls	✗
Dispersible Engineered Nanomaterial for argon gas has no controls	✗
Ergonomics (Human Factor) for argon gas has no controls	✗
Activity RHI Level = 3	✓

Please correct the issues identified above, and resubmit for review

[Return to review](#)

PAGE 3. Submit review. System checks for completeness of documentation and hazard assessment. Once submitted the review is locked unless a review rejects it. This returns the review to the P.I.

.....

Activity Title: test
HRA ID: 630.00.0089.052212i
Principal Investigator: Liz Mackey

.....

This email was generated by the MML Hazard Review and Approval System to inform you that the hazard review package for the activity shown above has been submitted and is ready for review.

The section below provides detailed information on what actions are required.

=====

- * ACTION REQUIRED BY: Liz Mackey
- * Please review the information in the hazard review package, which is located at:
<https://mmltest.nist.gov/mml/safety/public/activities/94>
- * Complete the review and approval form located at:
<https://mmltest.nist.gov/mml/safety/public/reviews/161/edit>
- * Please complete this review within one week.

=====

Accessing the Hazard Review and Approval System will require General credentials.
System Homepage: <https://mmltest.nist.gov/mml/safety/public/>

Q: What happens next?

A: Electronic routing for review and approval

.....
Activity Title: Big old attachment test
HRA ID: 630.00.0083.042612i
Principal Investigator: Liz Mackey

.....
This email was generated by the MML Hazard Review and Approval System to inform you that the hazard review package for the activity listed above has been approved by the Division Chief.

This approval constitutes authorization for the activity to commence.

Note that individuals must be authorized by their Group Leaders to perform the work. Division Chief approval is required to perform work alone and out-of-hours.

This new activity may now be performed as described.

View Activity: <https://mmltest.nist.gov/mml/safety/public/activities/84>

Accessing the Hazard Review and Approval System will require you to log in using your NIST General credentials.
System Homepage: <https://mmltest.nist.gov/mml/safety/public/>

Example emails from the test system



Highest RHI Level = 2 - Medium



Activity ID and Version: 630.01.0001.041213i
 Lab Contacts: Non-Lab Space (223/B326)
 Principal Investigator: Elizabeth A. Mackey
 Review Approvals: GL (2013-09-16 09:46:00) DSR (N/A) DC (2013-09-16 14:39:38)

User Name	AU Approval	Out of Hours Approval
Elizabeth A. Mackey	October 13, 2015	No Approval Required
Laslo Varadi	October 28, 2015	No Approval Required

Description	List of Documents	Required Training
This activity covers the transport, use and swap-out of compressed gas cylinders. It covers only physical hazards; hazards associated with toxicity, oxygen deficiency, or flammability must be covered in an activity-specific hazard review for the experiment or work.	Gas Cylinder Safety Presentation	Hands-on Training (Specify Trainer)

**Hazards
Required PPE**



Safety Glasses with side shields

Tasks/Substances	Hazard	Severity	Required Controls	Likelihood	RHI Level
2. transport of cylinder using a proper cart (Tasks/Equipment)	Ergonomics (Strain)	Moderate	Operating Procedures, Safe Practices, Hands-on Training (Specify Trainer) (experienced user)	Remote	2 - Medium
2. transport of cylinder using a proper cart (Tasks/Equipment)	Struck By (Mass Acceleration)	Moderate	Operating Procedures, Safe Practices, Hands-on Training (Specify Trainer) (experienced user)	Remote	2 - Medium
3. installation of cylinder; secure according to SOP (Tasks/Equipment)	Other (specify in documentation)	Catastrophic	Other Engineering Controls (Please Specify) (cylinder design), Operating Procedures, Safe Practices, Hands-on Training (Specify Trainer) (experienced user)	Improbable	2 - Medium
3. installation of cylinder; secure according to SOP (Tasks/Equipment)	Struck By (Mass Acceleration)	Moderate	Operating Procedures, Safe Practices, Hands-on Training (Specify Trainer) (experienced user)	Remote	2 - Medium
3. installation of cylinder; secure according to SOP (Tasks/Equipment)	Struck Against	Minor	Operating Procedures, Safe Practices, Hands-on Training (Specify Trainer) (experienced user)	Remote	1 - Low
5. install correct regulator (Tasks/Equipment)	Ergonomics (Strain)	Minor	Operating Procedures, Safe Practices, Hands-on Training (Specify Trainer) (experienced user)	Remote	1 - Low
5. install correct regulator (Tasks/Equipment)	Other (specify in documentation)	Moderate	Guard/Barrier (around valve), Operating Procedures, Safe Practices, Hands-on Training (Specify Trainer) (Experienced user), Safety Glasses with side shields	Remote	2 - Medium
5. install correct regulator (Tasks/Equipment)	Struck Against	Minor	Operating Procedures, Safe Practices, Hands-on Training (Specify Trainer) (experienced user)	Remote	1 - Low
6. Open cylinder valve (Tasks/Equipment)	Other (specify in documentation)	Severe	Other Device Use (Please Specify) (gas regulator), Operating Procedures, Safe Practices, Hands-on Training (Specify Trainer) (experienced user), Safety Glasses with side shields	Remote	2 - Medium

Compressed summary view of an approved hazard review. User approval table, combined NFPA, icons for PPE required for the activity. List of steps, materials, hazards, severity, required controls, likelihood, controlled RHI.

Highest RHI Level = 2 - Medium



Activity ID and Version: 642.10.0115.111513i
 Lab Contacts: John E. Bonevich (223/A120), John E. Bonevich (223/A132), John E. Bonevich (223/B113), John E. Bonevich (223/B115), John E. Bonevich (223/B117), John E. Bonevich (223/B119), John E. Bonevich (223/B127), John E. Bonevich (223/B131), John E. Bonevich (223/B133), John E. Bonevich (223/B139)
 Principal Investigator: Sandra W. Claggett
 Review Approvals: GL (2013-11-15 15:43:49) DSR (2013-11-25 13:27:10) DC (2013-12-10 13:19:51)

User Name	AU Approval	Out of Hours Approval
Sandra W. Claggett	December 10, 2013	No Approval Required
John E. Bonevich	December 10, 2013	No Approval Required
Eric Lass	December 17, 2013	No Approval Required
Maureen E. Williams	December 17, 2013	No Approval Required

Description **List of Documents** **Required Training**

Copied from 630.00.0004.041213i

This activity covers transport and transfer of less than or equal to 100 L of the following cryogen: Helium, Nitrogen, Argon. It does not cover uses for which any additional hazards may be encountered and specifically does not cover use of cryogen where use presents an oxygen deficiency hazard.

EMERGENCY RESPONSE:

Spill response: For a small spill, leave the area, allow the cryogen to boil off and the room ventilation to remove the excess gas. For a large spill or tipped dewar, leave the room and notify Division management and the safety office; do not re-enter until you are certain there is no risk of asphyxiation.

Contact with cryogen: remove loose clothing to prevent contact with skin.

Frostbite: Remove any clothing or jewelry that may restrict circulation to the burned or frozen area. Do not rub frozen areas. If possible, place the affected body part in a warm water bath (less than 105F). The individual should also be kept warm. Supportive treatment for shock should be provided. Seek medical help from the Health Unit.

safety, short list, example oxygen deficiency

Cryogen Training

Hazards



Low temperature

Required PPE



Gloves (specify type or types)



Safety Goggles



Face Shield



Lab Coat



Other PPE (Please Specify)



Foot Protection



Safety Glasses with side shields

Tasks/Substances	Hazard	Severity	Required Controls	Likelihood	RHI Level
1. Move Dewar from storage to use location (Tasks/Equipment)	Ergonomics (Strain)	Moderate	Safe Practices, Cryogen Training, Foot Protection (non-permeable, optional Steel-toed), Gloves (specify type or types) (Leather or thermal)	Remote	2 - Medium
4. Open valve and transfer cryogen, shut valve when full (Tasks/Equipment)	Temperature Extreme Cold	Minor	Safe Practices, Cryogen Training, Gloves (specify type or types) (Leather or Thermal), Safety Glasses with side shields	Remote	1 - Low
5. Pour from large to smaller Dewar (Tasks/Equipment)	Temperature Extreme Cold	Moderate	Safe Practices, Cryogen Training, Gloves (specify type or types) (Leather or Thermal), Safety Goggles	Occasional	2 - Medium
Liquid Argon (Principal Substances)	Temperature Extreme Cold	Moderate	Cryogen Training, Face Shield (recommended), Gloves (specify type or types) (thermal gloves recommended), Lab Coat (no cuffs, covered arms), Other PPE (Please Specify) (ensure closed non-permeable shoes), Safety Goggles	Occasional	2 - Medium
Liquid Helium (Principal Substances)	Temperature Extreme Cold	Moderate	Cryogen Training, Face Shield (recommended), Gloves (specify type or types) (thermal gloves recommended), Lab Coat (no cuffs, covered arms), Other PPE (Please Specify) (ensure closed non-permeable shoes), Safety Goggles	Occasional	2 - Medium

Users can be added or deleted from any hazard review by the PI and 1st level supervisor who can also change PI

Review and Approval

> Complete Review

Instructions

After reviewing the activity described, answer the following questions below. Answering "Yes" to all of the required selections will move the review on to the next phase. Answering "No" to any of the questions will reopen the activity for editing, and will notify the principal investigator so that they may provide further details or correct any errors.

Group Leader Review

Activity: 630.00.0220 - Protein quantitation (will open in new tab/window)

Highest RHI Level = 2 - Medium

Summary of Changes made to Activity (provided by PI):

Documentation (SOPs, emergency response plans, biohazard registrations, NIST 364/5, etc.) is complete.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Design Plans have been reviewed.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
All procedures (SOPs, work instructions, etc.) are sufficient.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Emergency response plans and/or accidental release procedures have been reviewed and are adequate.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Elimination of hazards or substitution with less hazardous materials or processes has been considered.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Appropriate engineering controls are included.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Appropriate administrative controls are included.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Proposed training is sufficient.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Personal protective equipment requirements are necessary and sufficient.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Compatibility with other lab activities has been evaluated and addressed as necessary.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Applicable regulatory, environmental and other requirements of NIST Safety Programs have been adequately considered.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>
Reviewer(s) agree(s) that the proposed mitigation techniques will reduce RHIs to levels indicated.	Yes <input type="radio"/>	No <input type="radio"/>	NA <input type="radio"/>

ATTESTATION FOR APPROVAL: I certify that a Hazard Review and PPE assessment have been conducted for this activity. By answering all questions in this review in the affirmative (either by answering "Yes" or "NA"), I indicate that this activity is approved based on the information included in this hazard review package.

FINAL approval by the Group Leader, Division Chief or OU Director (as applicable based on the RHI level and review conducted) attests that all controls are in place, residual risk is acceptable and work may commence.

NOTE: A negative ("no") response to any of the questions above will close this review, and reopen the activity for editing by the principal investigator (PI) as well as any designated editors. Upon making the necessary changes, the PI can re-submit the activity to continue the review process.

[Submit Review](#)

- Reviews are routed to 1st level supervisor (all RHI values); Safety Rep and 2nd Level supervisor (RHI≥2); Committee and Lab Director (RHI=3). Ability to proxy to safety personnel, other experts. Lab contacts notified.
- Focus is on adequate description of work, mitigation of hazards, risk assessment, compliance with safety programs and notification of neighboring labs if necessary.

Hazard Review and Approval System

Material Measurement Laboratory

> Action Items for Elizabeth A. Mackey

Activity Reviews

Id	Activity ID	Version	Title/Name	Status	Review level	Reviewing Official	Date	View Activity	Complete Review	View Review
168	630.00.0102	061812i	Filling a Dewar with Liquid Nitrogen	In Process	Division Safety Representative	Elizabeth A. Mackey				
169	630.00.0222	020113i	today today	In Process	Group Leader	Elizabeth A. Mackey				
175	630.00.0243	070113i	test again today	In Process	Division Chief	Elizabeth A. Mackey				
179	630.00.0219	012313i	General Office	In Process	Division Safety Representative	Elizabeth A. Mackey				
184	630.00.0226	042913i	RHI 0 Test	In Process	Group Leader	Elizabeth A. Mackey				
185	630.00.0270	091013i	Piranha Etch Modified by Liz (clone of 630.00.0082.042412i)	In Process	Group Leader	Elizabeth A. Mackey				
193	630.00.0273	092713	Confirm DSR gets email	In Process	Division Safety Representative	Elizabeth A. Mackey				
196	630.00.0278	110513i	November 5 testing	In Process	Safety Program Coordinator	Elizabeth A. Mackey				
200	630.00.0017	110513	Sample Preparation Laboratory	In Process	Division Safety Representative	Elizabeth A. Mackey				
204	630.00.0221	013113i	Acid Digestion (clone of 630.00.0092.052312i)	In Process	OU Review	Elizabeth A. Mackey				
208	630.00.0287	012814i	new activity	In Process	Division Safety Representative	Elizabeth A. Mackey				

The system sends weekly reminders of any outstanding approvals. Emails go to P.I. when approval completed.

User Authorizations

Activity ID	Version	Title/Name	User Requesting Approval	Date Requested	View Activity
630.00.0253	080713i	RHI Adjustment Test	Craig Vogel	Wed Aug 07 13:31:15 -0400 2013	
630.00.0272	092713i	Review Skipping - RHI 1	Craig Vogel	Fri Sep 27 10:20:26 -0400 2013	
630.00.0273	092713i	Review Skipping - RHI 2	Craig Vogel	Fri Sep 27 10:22:47 -0400 2013	

Lone Worker/Out of Hours Authorizations

No user authorizations require your attention at this time

Hazard Review and Approval -- Electronic Database

Search by activity parameters

Activity Details		Hazard Details	
Activity Name	<input type="text"/>	Hazard	Asphyxiation/Oxygen displacement Biologicals Chemical (Carcinogen) Chemical (Corrosive) Chemical (Flammable)
Experiment Description	<input type="text"/>	Required Signage	N/A Compressed Gas Cylinder Storage Confined Space Crane Forklift
Status	<input type="text"/> <ul style="list-style-type: none"> Active Revision Approved Approved/Update Pen New Replaced Under Review <small>CTRL-click to multi-select</small>	Storage Required	N/A Acid Base Biohazard Explosives lock
Rooms	<input type="text"/> / <input type="text"/> <small>Can select only building if necessary</small>	Activity RHI Level	All RHI 0 - Minim. 1 - Low 2 - Medium 3 - Serious 4 - Critical
Show Replaced Activities?	<input type="checkbox"/>	Control Details	
Principal Investigator	<input type="text"/> <small>First, Last, or partial</small>	<small>Selecting multiple controls will return a set which contains ANY of the selected controls</small>	
Review and Approval Details		Built-in Engineering Control	Enclosure/Isolation Ergonomic design Guard/Barrier Interlock/Auto-shutoff Other Engineering Controls (Please Specify)
Show Activities I've Approved	<input type="checkbox"/>	Applied Engineering Control	Biosafety Cabinet Use Glove Box (Specify Atmosphere) Nanomaterial Ventilated Enclosure Other Device Use (Please Specify) Use of Fume Hood
Show Activities I've Returned to PI	<input type="checkbox"/>	Administrative	Alarms Buddy System Industrial Hygiene practices Operating Procedures Safe Practices
Organization Details		Training	Biosafety (Biennial Refresher Required) Bloodborne Pathogens (Annual Refresher Required) Cryogen Training Hands-on Training (Specify Trainer) Laser Use Training
Division	<input type="text"/>	Personal Protective Equipment	Dust mask Face Shield Foot Protection Gloves (specify type or type) Head Protection
Group	<input type="text"/> <ul style="list-style-type: none"> Select Group 630.00 - Material Measurement Laboratory - HQ 640.00 - Office of Reference Materials - HQ 640.01 - Information Technology Services Group 640.02 - Materials and Physical Services Group <small>CTRL-click to multi-select</small>		
Substance/Task/Equipment Details			
Substance Name	<input type="text"/>		
Type	<input type="text"/>		

Look up information by location, person, hazards, mitigation strategies, training requirements and filter by organization or by status of the activity.

Hazard Review and Approval Database– Advantages for Managers

Who is working with what hazards in which locations

In the event of emergency -- what hazards exist in which rooms

Determine where incompatible activities may reside (search by room)

List of safety training requirements tied to work perform

List of safety equipment – useful for maintenance

List of PPE– useful to maintain supplies

Facilitates notification of users

- e.g., product recalls
- New safety information
- New requirements

Facilitates audits of high hazards, specific hazards, and specific types of PPE



Hazard Review and Approval Database– Advantages for Users

Collaboration among scientists– can share hazard reviews and work procedures

Database structure and work-flow make it easy to use -- workflow from left to right guides the user in how to perform risk assessment

Built-in drop down menus with list of hazards

Built-in drop down menus with controls that can be applied

Built-in tools, e.g., links to chemical inventory, glove-chemical compatibility guide, safety program guides

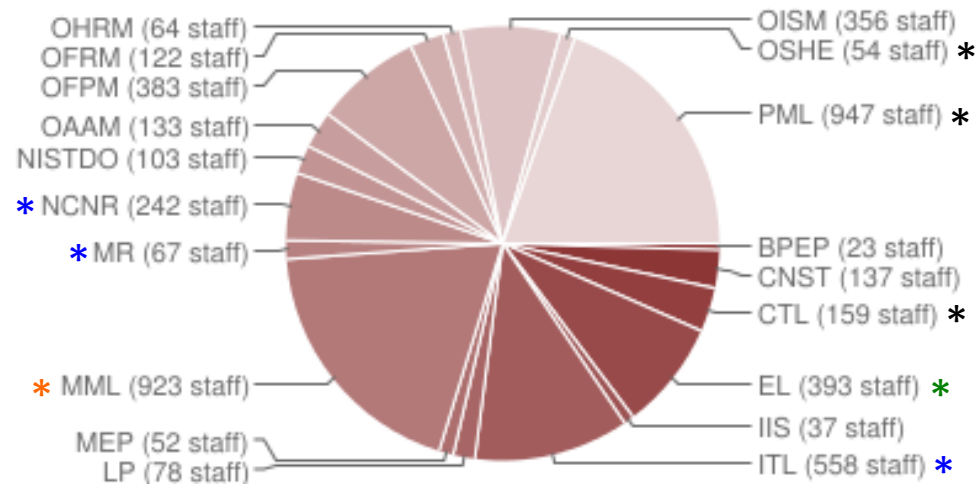
Educational process– used to teach new employees, post-docs, students how to work safely



Can I see your hazard review for that work?

Biggest Challenge: RHI Matrix Judgment, lack of consistency

NIST Staffing (4831 staff) as of March 11, 2016



MML launched the system in March 2013. OSHE, PML, CTL, joined in 2014*. EL in 2015*, and ITL, MR, and NCNR in 2016**

Thank you for the opportunity to give this presentation!

Questions?