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>> HI, EVERYBODY.

THIS IS HOPE FOR LEARNING TIMES.

WE'RE ABOUT TO GET STARTED

HOPEFULLY YOU'RE HEARING US

OKAY.

IN THE INTEREST OF TIME I'M

GOING TURN THINGS OVER TO

KRISTIN LAYES RIGHT AWAY AND

START THE RECORDING AND WHENEVER

YOU'RE READY THE FLOOR IS YOURS.

>> THANKS, HOPE.

HI EVERYONE I'M FROM HERITAGE

PRESERVATION AND WELCOME TO THE

ONLINE COURSE.

THIS IS OUR FIRST COURSE THAT

WE'RE OFFERING COLLECTIONS CARE

BASICS, WHERE DO I BEGIN AND WE

WANT TO THANK AGAIN THE

INSTITUTION OF MUSEUM AND

LIBRARY SERVICES TO MAKE GREAT

FUNDS AVAILABLE FOR THE LOWER

BUSH 21st CENTURY LIBRARIAN

GRANT AND WANT TO THANK HOPE FOR

HELPING US PRODUCE THE WEBINARS.

WE HOPE YOU ARE HEARING US WELL

AND THANK YOU FOR SAYING HELLO

IN THE CHAT BOX TO THE LEFT OF

THE SCREEN.

WE'RE GONNA ACTUALLY IN A MINUTE

GOING TO CLOSE THAT AND DRAG IT

AWAY.

FEEL FREE TO CONTINUE TO TYPE IN

QUESTIONS FOR US.

WE WILL BE WATCHING FOR THOSE

QUESTIONS AND COMMENTS AND IF IT

HAS TO DO WITH TECH ISSUES OR

LOGISTICAL QUESTIONS WE'LL

ANSWER PRIVATELY BUT IF IT HAS

TO DO WITH THE TOPIC WE'LL

PUBLISH IT.

SO IF YOU DON'T SEE YOUR QUESTION IN PRINT DON'T PANIC WE'LL ANSWER.

I WANTED TO GIVE YOU TIPS ON TECH ISSUES WE HAD YESTERDAY. A FEW TROUBLE-SHOOTING TIPS. IF YOU'RE HAVING TROUBLE WITH SOUND YOU MAY WANT TO CLOSE SOME OF THE OTHER PROGRAMS ON YOUR SCREEN THAT YOU MIGHT HAVE RUNNING ON YOUR COMPUTER RIGHT NOW.

DON'T CLOSE YOUR BROWSER BECAUSE YOU MIGHT LOG OUT OF THIS BUT THAT'S ONE THING THAT TENDS TO HELP PEOPLE.

IF YOU'RE HEARING AN ECHO YOU MAY HAVE MISTAKENINGLY LOGGED IN TWICE SO CHECK FOR THAT AND IF YOU'RE STILL HAVING TROUBLE HOPEFULLY THE CLOSED CAPTION HELPS WITH THIS ISSUE.

SOMETIMES IF YOU'RE ON A WIRELESS NETWORK IF IT'S SPOTTY THE SOUND CAN CUT IN AND OUT. ALSO I WANT TO LET YOU KNOW AGAIN I'M GOING TO DRAG THE CHAT AWAY.

I DON'T MEAN TO CUT ANYBODY OFF BUT I'M GOING DRAG THIS AWAY AND YOU WILL SEE OUR Q AND A BOX WE'LL USE TODAY DURING OUR SESSION.

TODAY YEAR DISCUSSING COLLECTIONS ENVIRONMENT AND WE HAD A LOT OF QUESTIONS YESTERDAY ABOUT THE ENVIRONMENT AND I WANT TO LET YOU KNOW WE PASSED THOSE ALONG TO OUR INSTRUCTOR AND WILL HOPEFULLY GET TO THEM TODAY AND WE HAVE SUCH GREAT INTEREST IN THE COURSE AND SO PLEASED TO HAVE YOU HERE.

WE HAVE ALMOST 300 LOGGED IN AGAIN TODAY AS WE DID YESTERDAY. WE HAVE A COUPLE POLL QUESTIONS

WHO YOU ARE.

WE HAD A FEW YESTERDAY AND I WANT TO CHECK AND SEE WHERE FOLKS ARE COMING FROM TODAY. YESTERDAY WE ASKED FOR WHAT TYPE OF INSTITUTION YOU WORK AT AND TODAY I THOUGHT IT WOULD BE INTERESTING TO SEE WHY YOUR ATTENDING FROM.

WE'VE HAD A NUMBER OF OVERSEAS PARTICIPANTS.

I DON'T THINK ANYONE IS UP LATE IN AUSTRALIA OR LATE, NOT SURE WHAT IT MIGHT BE.

DID LOOKS LIKE NICE DIVERSITY FROM ALL OVER THE COUNTRY AND A LITTLE IN CANADA AND HELLO TO EVERYONE FROM EUROPE, CENTRAL AMERICA OR AFRICA.

THAT'S VERY COOL.

OKAY.

I'M GOING TO DRAG THE POLL AWAY.

ALSO WE HAVE A NUMBER OF STUDENTS PARTICIPATING.

A LOT OF EMPLOYEES OF COLLEGE AND UNIVERSITIES.

THOUGHT WE'D ASK A QUICK POLL QUESTION TO THOSE FOLKS.

IF YOU WANT TO TELL US A LITTLE BIT ABOUT YOURSELF.

SOME ARE ASSOCIATED.

I WANT TO GIVE A SHOUT OUT TO THOSE THAT ARE.

GREAT.

SO A COUPLE GRAD STUDENTS HANGING IN THERE.

A NUMBER OF EMPLOYEES AT UNIVERSITY TOO.

THANKS FOR THAT.

WE'LL BE ASKING SIMILAR QUESTIONS AS THE COURSE GOES ON. AND WE HAD SOME REALLY GREAT QUESTIONS YESTERDAY AND IN FACT SOME OF THEM HAVE INSPIRED A DISCUSSION ON OUR ONLINE COMMUNITY.

IF YOU HAVE JOINED IT'S THE SAME

WEBSITE YOU WENT TO THAT'S
CONNECTING TO COLLECTIONS DOT
ORG AND THIS IS ANOTHER GREAT
WAY TO INTERACT WITH US AND YOUR
COLLEAGUES.

WE HAVE A LOT OF CONSERVATORS
AND WE HAVE LINKS OF TOPIC OF
INTEREST AND WEBINARS WE'VE
DONE.

WE HAVE TWO DOZEN AT LEAST.
SO WE'VE DESIGNED THIS TO BE A
ONE-STOP SHOP FOR REPUTABLE
INFORMATION ABOUT CONSERVATION
AND PRESERVATION AND WE HOPE
YOU'LL MAKE THE MOST OF IT
I WANT TO ALSO REITERATE THIS
COURSE AND THE FACT THAT WE'RE
OFFERING A CERTIFICATE OF
COMPLETION.

SO IF YOU ATTEND ALL OUR SIX
WEBINAR AND COMPLETE OUR HOME
WORK ASSIGNMENTS FOR YOU'LL EARN
A CERTIFICATE OF COMPLETION.
DON'T PANIC IF YOU HAVE TO MISS
A WEBINAR.

YOU CAN WATCH IT ON YOUR OWN
TIME.

HOPEFULLY YOU GOT A LINK WITH
YESTERDAYS A WEBINAR AND WE'LL
DO THE SAME AFTER THIS WEBINAR
CONCLUDES.

PROBABLY SEND IT OUT TOMORROW
FOR EVERYONE AND FOR WHATEVER
REASON YOU DIDN'T RECEIVE IT
FEEL FREE TO DROP US AT NOTE AT
HERITAGE PRESERVATION DOT ORG
AND WE HOPE OR ASK YOU WATCH ALL
THE WEBINARS AND DO ALL THE
HOMEWORK NO LATER THAN JANUARY
31st TO KEEP ON TRACK WITH
EVERYTHING.

AGAIN, THERE'S A PAGE FOR THIS
WHOLE COURSE COLLECTING FOR
CONNECTIONS DOT ORG IS THE HOME
PAGE AND CLICK ON COURSES AND
COLLECTIONS AND THERE'S HOMEWORK
AND READINGS OUR SPEAKERS HAVE

THOUGHT OF IN ADVANCE.
THINGS CAME UP YESTERDAY IN
CONVERSATION LIKE THE COCKTAIL
RECIPE.
WE PUT THAT UP.
SO WE'RE CONSTANTLY UPDATING AND
IMPROVING THE PAGE SO KEEP
COMING BACK TO IT.
AND THEN JUST ANOTHER NOTE ON
HOMEWORK, WE'RE TRYING TO GET IT
ALL DONE BY JANUARY 31st.
TODAY'S HOMEWORK IS ACTUALLY A
QUIZ BUT DON'T PANIC
YOU DON'T HAVE TO EARN 100% TO
GET CREDIT.
WE'RE NOT GOING TO TELL YOU HOW
YOU DID SCORE BECAUSE THERE'S
300 OF YOU GUYS AND CAN'T
PROVIDE INDIVIDUAL FEEDBACK BUT
TELL YOU HOW THE GROUP DID AND
THE QUESTIONS ARE FAIRLY
STRAIGHT FORWARD AND GIVES OUR
INSTRUCTORS TO GET A SENSE
WHETHER THEIR CONCEPTS ARE WITH
THE GROUP.
OH, YES, IF YOU'RE CERTIFIED YOU
CAN EARN UP TO FIVE CONTINUING
EDUCATION CREDITS FOR THE
COURSE.
DON'T FORGET ABOUT THAT AND I
WANT TO INTRODUCE OUR SPEAKER
FOR TODAY.
IT'S TARA KENNEDY.
SHE IS A PAPER CONSERVATOR AT
YALE UNIVERSITY AND DOES
CONSULTING ON PRESERVATION
THROUGHOUT THE COUNTRY AND HAS
AN A DECADE OF EXPERIENCE AND
RECENTLY DID A GREAT WEBINAR ON
COLLECTING TO CONNECTIONS ONLINE
ACTIVITY WITH ORDER AND
COLLECTIONS.
SO LET'S NOT ASK HER QUESTIONS
ABOUT THAT TODAY BUT I CAN POST
THE LINK AND IT WAS VERY USEFUL
ONE-HOUR WEBINAR WHERE SHE
ANSWERED A LOT OF INTERESTING

QUESTIONS ON THAT ISSUE.
SO I'LL TURN IT OVER TO TARA.
BUT AGAIN IF DURING THE
PRESENTATION YOU HAVE QUESTIONS
OR COMMENTS TYPE IT IN THE Q AND
A BOX LEFT OF THE SCREEN AND
WE'LL GET BACK TO YOU.
TO TARA, I'M GOING TO GET YOU
GOING.

>> GREAT.

THANKS, KRISTIN.

HI, EVERYBODY I'M TARA KENNEDY
I'M REPRESENTING MYSELF AS A
PRESERVATION CONSULTANT BUT
DURING THE 9:00 TO 5:00 LIFE I'M
THE LIBRARIAN AT YALE UNIVERSITY
AND TELL YOU WHAT WE'LL BE
TALKING ABOUT TODAY FOR THE
PURPOSE OF THE LECTURE OVERALL
IS TO CONVEY THE IMPORTANCE OF
THE AFFECTS OF LIGHT,
TEMPERATURE, RELATIVELY HUMIDITY
AND COLLECTION OF OBJECTS AND
PRACTICAL INFORMATION AND
SOLUTIONS TO SOLVING ISSUES THAT
YOU MAY BE HAVING IN YOUR
COLLECTIONS IN TERMS OF
ENVIRONMENT.

IT'S DIVIDED INTO THREE
SECTIONS.

ONE'S ON LIGHT, ONE'S ON
RELATIVE HUMIDITY AND
TEMPERATURE AND POLLUTANTS.
I'LL BE PAUSING IN BETWEEN THE
SECTIONS FOR ANY QUESTIONS ON
THE SECTION YOU MAY HAVE AND OF
COURSE I CAN TAKE ALL YOUR
QUESTIONS AT THE END AS WELL.
KRISTIN WAS KIND ENOUGH TO SEND
YOUR QUESTIONS ALONG TO ME THAT
PERTAIN TO TEMPERATURE AND
RELATIVE HUMIDITY AND THAT SORT
OF THING SO HOPEFULLY I'LL BE
ABLE TO ANSWER THOSE AS WELL AS
WE GO ALONG.

.
ALL RIGHT.

>> OUR FIRST QUESTION ON LIGHT.
I'M GOING TO TALK A LITTLE BIT
ABOUT WHAT LIGHT IS.

SO LIGHT IS ENERGY ON A CERTAIN
PART OF A WAVE LENGTH SPECTRUM
SO THE PARTS I'LL TALK ABOUT IS
180 NANOMETERS TO 850 NANOMETER
AND THAT'S SIMPLY HOW WE EXPRESS
MEASUREMENT IN LIGHT.

IN TERMS OF WAVELENGTH.

NEXT SLIDE.

SO BEYOND THE BLUE LIGHT IS
ULTRAVIOLET LIGHT AND THIS IS
THE ELEMENT OF LIGHT THAT BURNS
OUR SKIN WHEN WE HANG OUT ON THE
BEACH ON THE RANGE ABOVE UC
WAVELENGTHS ARE HIGHER
WAVELENGTHS LIKE X-RAYS AND
GAMMA RADIATION WHICH ARE HIGHER
ENERGY AND MORE DAMAGING THAN
ULTRAVIOLET.

NEXT SLIDE.

AND BEYOND THE RED PORTION OF
THE LIGHT SPECTRUM IS INFRARED.
AGAIN, WE CAN'T SEE THIS EITHER
BUT WE FEEL IT AS HEAT.

SO THIS IS LOWER ENERGY THAN
OTHER PARTS OF THE SPECTRUM.
IT'S AN ABOUT 660 TO 880 NANO
METERS AND THESE ARE LOWER
ENERGY WAVELENGTHS INCLUDING
MICROWAVE AND RADIO WAVES.

NEXT.

VISIBLE RANGE IS THE LIGHT WE
CAN SEE AND WE NEED IN ORDER TO
SEE.

THIS IS MOST RELEVANT TO US IN
TERMS OF THE COLLECTION
ENVIRONMENT.

NEXT SLIDE.

SO A COUPLE THINGS TO KEEP IN
MIND WHEN YOU ARE LIGHTING A
ROOM, LIGHTING A DISPLAY, YOU
DON'T NEED ULTRAVIOLET RIGHT OR
INFRARED.

THEY'RE NOT NEEDED TO PERCEIVE
COLOR AT ALL

YOU WANT TO ELIMINATE THESE TWO AS MUCH AS YOU CAN ESPECIALLY THE EXHIBIT ENVIRONMENT AND THE COLLECTIONS ENVIRONMENT IN A READING ROOM AND THAT SORT OF THING BECAUSE YOU WANT TO EXPOSE YOUR MATERIAL TO AS LITTLE AS THESE LIGHT SOURCES AS POSSIBLE ESPECIALLY ULTRAVIOLET BECAUSE IT'S SO DAMAGING.

BUT THE ONE THING I WANT EVERYONE TO KEEP IN MIND IS ALL TYPES OF LIGHT WILL CAUSE DAMAGE WHETHER THAT BE ULTRAVIOLET OR INFRARED.

ALL WILL CAUSE SOME SORT OF DAMAGE IN YOUR COLLECTIONS.

SO THE OTHER THING TO ALSO NOTE IS THE SAME AMOUNT OF DAMAGE IS GOING TO OCCUR WHETHER IT'S A LITTLE BIT OF LIGHT OVER A VERY LONG PERIOD OF TIME OR A LOT OF LIGHT IN A VERY SHORT PERIOD OF TIME AND I'LL TALK A LITTLE BIT ABOUT WHAT ARE RECOMMENDED LEVELS ARE IN TERMS OF WHEN YOU WANT TO HAVE SOMETHING ON DISPLAY AND THAT SORT OF THING. NEXT SLIDE.

SO WHAT DOES LIGHT DO TO OBJECTS.

SO MANY OBJECTS IN OUR COLLECTIONS HAVE COLORS AS PART OF OVERALL MAKEUP.

IN CHEMISTRY LAND WE CALL COLORING GROUPS CHROMOPHORES HAVE DOUBLE BONDS AS PART OF THEIR INHERENT CHEMICAL COMPOSITION SO CHEMICAL REACTIONS OCCUR FROM LIGHT ENERGY AND ACIDIC DEGRADATION BREAK UP THE DOUBLE BONDS LIKE THEY'RE SHOWING HERE IN THIS ILLUSTRATION HERE.

WHAT HAPPENS IT'S ATTACKED IT CHANGES THE COLOR.

WHEN YOU SEE SOMETHING THAT'S

YELLOWED OR COLORED OVER TIME
EXPOSED TO LIGHT THAT'S WHAT'S
HAPPENING.

DOUBLE BONDS ARE BREAKING AND
IT'S ALTERING THE COLOR BECAUSE
THE WAY THE LIGHTED REFLECTS ON
THE OBJECT AND HOW YOU'RE SEEING
IT RESPOND.

THAT'S CHANGED BECAUSE THE
CHEMICAL MAKEUP THE ACTUAL

CHROMOPHORE HAS CHANGED.

IT'S COOL.

CHEMISTRY IS COOL.

HERE'S AN EXAMPLE OF WHAT LIGHT
CAN DO OVER TIME.

WHAT WE HAVE HERE ON THE LAST --
THEY ARE BOTH IMAGES, BY THE
WAY, TAKEN IN A CONSERVATION
CONTEXT FOR PHOTO DOCUMENTATION.
THESE ARE GOOD QUALITY
PHOTOGRAPHS.

THE IMAGE ON THE LEFT A PAINTING
CALLED ECHO BY JACKSON POLLACK
FROM 1987 AND THE IMAGE IS THE
SAME PAINTING IN 2012.

SO ECHO HAS BEEN DESCRIBED BY A
PIECE FROM THE POLLACK BLACK AND
WHITE SERIES AND NOW BETTER
DESCRIBED AS A BLACK AND
STRAW-YELLOW SERIES AS YOU CAN
SEE THE OVERALL CANVAS HAS YELL
OWED OVER TIME.

CANVAS IS MADE BY ORGANIC
MATTERS THAT DETERIORATE DUE TO
LIGHT AND HEAT THAT BREAK DOWN
THE FIBERS AND CHANGE HOW THE
LIGHT ABSORB IT GIVING IT A
YELLOW RATHER THAN A WHITE
APPEARANCE AS IT WAS BEFORE.
THIS IS SORT OF A PRACTICAL
EXAMPLE OF WHAT HAPPENS IN TERMS
OF COLOR CHANGE AND WHAT LIGHT
ENERGY CAN DO TO ORGANIC
MATERIALS.

NEXT SLIDE, PLEASE.

SO AS I MENTIONED, TOTAL LIGHT

-- WELL, SORT OF MENTIONED,
TOTAL LIFETIME EXPOSURE IS THE
MOST IMPORTANT FACTOR WHEN IT
COMES TO LIGHT.

NEXT.

THAT CAN BE ESSENTIALLY
DESCRIBED IN THIS VERY SIMPLE
CALCULATION WHICH TOTAL EXPOSURE
WOULD BE THE INTENSITY OF THE
LIGHT PLUS THE AMOUNT OF TIME ON
DISPLAY OR EXPOSED TO LIGHT.

SO IF YOU CONSIDER THE SUN IS
ABOUT TEN TO 15,000 WATTS IN
JUST ONE MEASUREMENT, IT KIND OF
MAKES PEOPLE TWICE ABOUT USING
NATURAL LIGHT AS A METHOD OF
LIGHTING UP A DISPLAY OR
SOMETHING LIKE THAT.

BECAUSE IT'S INCREDIBLY HIGH
ENERGY.

NEXT.

AND THE OTHER THING I'D LIKE TO
NOTE IS THAT FADING AND COR
CHANGE CANNOT BE REVERSED.

HERE'S AN EXAMPLE OF A FADING
PROBLEM.

THE CLIENT BROUGHT ME THIS
CERTIFICATE AND WANTED ME TO RE
STORE THE INK THAT WAS FADED AND
WAS DISPLAYED IN A PART OF THEIR
HOME AND THE PERSON WANTED ME TO
BRING BACK THE INK.

I THINK SHE'D BEEN WATCHING TOO
MANY CSI SHOWS, SOMETHING ALONG
THOSE LINES.

I HAD TO EXPLAIN TO HER ONCE INK
IS FADED IT CANNOT BE REVERSE --
IT CANNOT BE BROUGHT BACK.

YOU CAN USE LIGHT SHOW WHERE IT
WAS BUT YOU CANNOT RE STORE IT
SHORT OF TAKING A MARKER AND
REPLACING WHERE IT WAS AND
NOBODY WANTS TO DO THAT TO THEIR
OBJECTS.

I WANT TO GIVE AN EXAMPLE OF
WHAT CAN HAPPEN EVEN WHEN YOU
DON'T HAVE THINGS IN DIRECT

SUNLIGHT.

INCHES CAN BE INCREDIBLY
FUGITIVE.

IT'S SOMETHING TO BE AWARE OF
AND TAKE INTO ACCOUNT WHEN YOU
PUT ITEMS ON DISPLAY.

NEXT.

SO I'LL TALK A LITTLE BIT ABOUT
THE DIFFERENT KINDS OF
ARTIFICIAL LIGHT SOURCES
AVAILABLE TO YOU YOU CAN USE
WHETHER IT'S IN A DISPLAY
ENVIRONMENT OR JUST IN YOUR
GENERAL ROOM WHERE YOU'RE DOING
WORK.

IN CANDESCENT LIGHTS ARE THE
HOLDEST STYLE AND HAVE LOW OF UV
AND THERE'S A FLUORESCENT AND YOU
WANT IT MAKE SURE THE BULB IS
FAR FROM YOUR OBJECTS.

YOU DON'T WANT IT IN A CASE
BECAUSE HEAT WOULD BUILD UP
QUICKLY.

NEXT, HALOGEN LIGHTS.

THEY'RE THE WORSE OF BOTH WORLDS
UNFORTUNATELY.

THEY HAVE ULTRAVIOLET AND
INFRARED SO YOU REALLY NEED TO
FILTER THEM FOR ULTRAVIOLET IF
YOU USE THEM IN YOUR COLLECTION
ENVIRONMENT AND KEEP THEM FAR
FROM OBJECTS AS WELL SO THEY
DON'T ADD HEAT.

NEXT.

FLORESCENT LIGHT.

THIS IS A COMMON LIGHT YOU'RE
SEEING THESE DAYS MOSTLY BECAUSE
THEY'RE LOW ENERGY ESPECIALLY
THE COMPACT FLORESCENT LAMPS YOU
SEE HERE I HAVE IN THE SLIDE
THERE.

ONE PROBLEM WITH FLORESCENT
LIGHTS, THEY HAVE A LOT OF ALL
THAT VIOLET LIGHT IN THEM BUT
YOU CAN GET DIFFERENT LAMPS --
WHEN I SAY LAMPS I MEAN BULB.
YOU CAN GET DIFFERENT BULBS THAT

WILL EMIT LOWER UV EMISSIONS.
GENERAL ELECTRIC, GE MAKES BULBS
CALLED COVER GUARD THAT EMIT LOW
UV.

THOSE ARE A GOOD CHOICE IF YOU
CAN CHOOSE WHAT TYPE OF BULB YOU
HAVE IN FOR LIGHT.

YOU CAN ALSO GET THESE SLEEVES
WHICH WE HAVE AT YALE AND WE
FOUND THESE SLEEVE HAS IT GO ON
TOP OF THE BULBS THAT ARE
GRADIENT.

BASICALLY WHAT THAT MEANS IS YOU
CAN SORT OF TURN THE SLEEVES AND
REDUCE THE AMOUNT OF LIFE
EMITTED.

IT TAKES OUT UV AND WILL REDUCE
THE AMOUNT OF VISIBLE LIGHT AND
MAKE IT DIMMER OR GREATER AND
CHANGE WHAT'S IN THERE IN TERMS
OF DISPLAY.

I HAVE LINKS TO THOSE IF YOU'RE
INTERESTED IN THE RESOURCES.

YOU CAN PURCHASE THEM AND USE
THEM YOURSELF AND ONE ADVANTAGE
WHY FLORESCENT LIGHTING IS NICE
THEY HAVE LOW HEAT.

YOU DON'T HAVE TO WORRY ABOUT
OVER HEATING YOUR OBJECT.

NEXT.

HIGH INTENSITY DISCHARGE ARE
USUALLY IN OUTDOOR LIGHTING.
THERE'S TOO MUCH LIGHTING AND
HEAT SO NOT SOMETHING YOU'LL SEE
OFTEN.

NEXT.

FIBEROPTICS IS OFTEN USED IN
DISPLAY.

THEY'RE A GOOD OPTION AND LOW
ULTRAVIOLET BUT THEY DON'T EMIT
A GREAT DEAL OF LIGHT SO THEY'RE
BEST FOR DARKER SPACES.

THE BOX THAT'S ATTACHED, THIS IS
WHERE THE LIGHT SOURCE IS COMING
FROM BUT THIS IS THE ENERGY
SOURCE.

THIS EMITS A LOT OF HEAT SO

NEEDS TO BE IN A SPACE THAT'S
WELL VENTILATED.

.
NEXT.

LEDs, LIGHT EMITTING DIODE
LIGHTS ARE MAKING QUITE A SPLASH
IN THE EXHIBIT WORLD.

THEY HAVE NO HEAT GAIN, NO
ULTRAVIOLET AND WHEN THEY FIRST
CAME OUT THEY GAVE THIS WEIRD
CAST LIKE A COOLER COLOR
TEMPERATURE SO THEY WERE KIND OF
HARD TO USE IN DISPLAY BECAUSE
THEY DIDN'T RENDER COLORS VERY
WELL IN THE EXHIBIT ENVIRONMENT.
NOW THEY'VE ACTUALLY MADE THEM
IN A DIFFERENT VARIETY OF COLOR
TEMPERATURES SO IT DOESN'T LOOK
SO BIZARRE WHICH IS NICE.

NEXT.

SO WHICH DO I CHOOSE?

COST WILL BE ONE OF THE BIGGEST
FACTORS.

SOME LIGHT SOURCES ARE GOING TO
BE LESS EXPENSIVE AND LEDs,
DIODES ARE MORE EXPENSIVE SO YOU
MAY NOT ABLE TO DO THOSE BUT YOU
CAN DO THINGS LIKE IF YOU ONLY
HAVE FLORESCENT LAMPS, YOU CAN
DO SLEEVES OR GET LOW UV BULBS.
THERE'S A VARIETY.

THERE ARE THINGS YOU CAN DO TO
REDUCE THE POSSIBILITY OF DAMAGE
FOR YOUR COLLECTIONS.

AND APPLICATION IS THE OTHER
THING TO THINK ABOUT.

IF IT'S A DISPLAY VERSUS YOU'RE
JUST USING IT IN A READING ROOM
OR JUST A TASK LAMP.

THESE ARE THINGS YOU HAVE TO
TAKE INTO CONSIDERATION WHEN YOU
ACTUALLY CHOOSE THEM.

SO FOR MEASURING AND MONITORING
LIGHT THERE'S A PASSIVE METHOD
WHICH IS AN EASY ONE USING A
BLUE WOOL STANDARD CARDS.

THEY CAN BE USED TO SHOW

ACCUMULATED DAMAGE VISIBLE OR
ULTRAVIOLET LIGHT YOUR
MEASURING.

THERE'S AN EXAMPLE OF SOME USED.
YOU WANT ONE IN THE DARK AND ONE
NOT EXPOSED TO LIGHT TO HAVE IT
TO COMPARE TO AND THEN YOU CAN
TAKE YOUR SO THE MIDDLE ONE IS
COVERED IN FOIL ON THE LEFT HAND
SIDE AND THE UV FILM IS ON THE
FAR RIGHT SO WHEN THEY PUT IT IN
THE EXHIBIT CASE AND LIFTED AWAY
THE ALUMINUM FOIL AND THE UV
SLEEVE YOU CAN SEE THE
DIFFERENCE.

THE MIDDLE HAS SIGNIFICANT
DAMAGE AND YOU CAN SEE UV DAMAGE
HAS SOMEWHAT BUT NOT A GREAT
DEAL IN THIS PARTICULAR INSTANCE
WITH THE LIGHTER COLORS.

IN THE WAY THE SCALE WORKS THE
TOP SCRIPT IS THE MOST FUGITIVE,
MEANING THE MOST LIKELY TO FADE.
AND THEN ALL THE WAY DOWN AT THE
BOTTOM IS THE ONE THAT'S GOING
TO BE THE LEAST LIKELY TO FADE
SO.

NEXT.

YOU CAN ALSO USE ACTIVE METHODS
LIKE LIGHT METERS.

THE METER ON THE RIGHT IS A
STANDARD LIGHT METER YOU WOULD
USE IN PHOTOGRAPHY AND THOSE ARE
PERFECTLY FINE TO USE FOR
MEASURING VISIBLE LIGHT.

I USE ONE LIKE THIS ON SITE
VISITS AND HAVE A DIFFERENT ONE
TO MEASURE ULTRAVIOLET LIGHT.

NEXT.

THIS ONE IS A LITTLE MORE
HIGH-END MODEL BY A LITTLE MORE
SCIENTIFIC.

IT'S CALLED THE O-E-S-S-B-C.
IT MEASURES RELATIVE COMMUNITY
AND DOES IN THINGS IN ONE.

NEXT.

SO THE IMAGE I'M SHOWING IS

SOMEONE WHO IS TAKING AN INCIDENT READING OF LIGHT. WHAT I MEAN IS THEY'RE STANDING IN FRONT OF THE OBJECT AND WANT TO MEASURE THE LIGHT BEING CAST ON THE OBJECT AND THAT'S WHAT THIS WOMAN'S DOING WITH THE TEXTILE.

YOU CAN MEASURE REFLECTIONS AND WE CALL THAT A REFLECTIVE READING.

THE LIFETIME LEVELS IN TERMS OF EXPOSURE AND THINGS AND WHAT THINGS CAN TOLERATE WILL VARY UPON THE TYPE OF MATERIAL.

NEXT.

AND THIS IS ANOTHER TYPE OF LIGHT METER THAT YOU CAN PLACE IN AN EXHIBIT CASE AND MEASURE LIGHT LEVELS OVER TIME WHILE SITTING THERE IN THE CASE. IT'S UNFORTUNATELY MORE EXPENSE. THIS HANDWELL MODEL GOES FOR \$900 A PIECE.

SO A LITTLE EXPENSIVE BUT YOU HAVE TO SEE ALL YOUR OPTIONS BEFORE YOU BUY, RIGHT.

NEXT.

SO ONE OF OTHER THINGS WHEN YOU'RE MEASURING LIGHT LEVELS IT'S IMPORTANT TO KEEP RECORDS. FOR EXAMPLE, IF HAVE YOU UV FILTERS ON YOUR FLORESCENT BULBS YOU CAN TRACK WHEN THEY NEED TO BE CHANGED.

THERE'S VARIATION I HEARD OF TERMS OF HOW LONG THE FILTERS WORK.

I'VE HEARD 15 YEARS, I'VE HEARD LONGER.

IT'S REALLY A GOOD IDEA TO GET IN THE HABIT OF MEASURING THE LIGHT LEVEL TO MAKE SURE THEY ARE ACTIVELY WORK FOR YOU.

NEXT.

SO RECOMMENDED DISPLAY LIGHT LEVELS.

50 LUX WHICH IS THE EUROPEAN MEASUREMENT FOR MEASURING LIGHT AND AMERICANS IS FOOT CANDLES. IT'S 50 LUX IN EUROPE AND FIVE TO 20 FOR FOOT CANDLES.

IT MEANS ART ON PAPER, WATER, COLORS, TEXTILES, BOTANICAL SPECIMENS AND DYES THAT ARE SENSITIVE TO LIGHT.

ONLY 20 LUX OR TWO-FOOT CANDLES IS NECESSARY FOR THE HUMAN EYE TO PERCEIVE COLOR.

IT SEEMS LIKE NOT A LOT OF LIGHT BUT IT ACTUALLY IS SUFFICIENT FOR YOUR EYE TO PERCEIVE COLOR. SO FOR LESS SENSITIVE ARTIFACTS AND THAT MEANS METALS, CERAMICS, GLASS, SOME PAINTINGS AND FURNITURE DEPENDING UPON WHAT KIND OF FINISHES IT MIGHT HAVE OR ANY COLORANT IT MIGHT HAVE, 50 TO 200 LUX OR 5 TO 20 FOOT CANDLES IS THE MAXIMUM LIGHT LEVELS WE RECOMMEND IN CONSERVATION AND FOR ULTRAVIOLET IS 65 PER LOOMEN BUT IF YOU CAN ELIMINATE IT FROM THE DISPLAY LIGHT THAT'S THE BEST RECOMMENDATION BEGAN GIVE BECAUSE ULTRAVIOLET IS NOT NECESSARY FOR THE EYE TO SEE AND NOT PART OF THE VISUAL SPECTRUM. WE DO NOT NEED IT SO IF YOU CAN TAKE OUT, TAKE IT OUT.

NEXT.

WE TALKED ABOUT HOW TO CONTROL LIGHTS IN EXHIBIT SPACES.

WHEN I TALK ABOUT THE FIVE FOOT CANDLES OR 60 LUX WHICH SEEMS DARK THERE'S WAYS TO MAKE THE EYES TO FOOL THE EYE INTO THINKING IT'S BRIGHTER THAN IT IS.

IN THIS EXAMPLE.

SKYLIGHTS YOU CAN ACTUALLY USE THEM SAFELY ESPECIALLY IF IT'S REFLECTIVE LIGHT IF YOU BOUNCE

IT OFF THE WALL AND USE REFLECTIVE LIGHT OF LIGHTING A SPACE IS MUCH SAFER BECAUSE YOU'LL REDUCE THE AMOUNT OF ENERGY IN LIGHT LEVELS JUST BY BOUNCING IT OFF A SURFACE.

NEXT.

I'D MENTIONED THIS A NUMBER OF TIMES.

FILTERS.

YOU CAN FILTER WINDOWS, YOU CAN PUT FILMS ON WINDOWS TO REDUCE VISIBLE AND ULTRAVIOLET HEAT. THEY MAKE A NUMBER AND YOU CAN BE INSTALLED PROFESSIONALLY OR DO IT YOURSELF AND REDUCE THE AMOUNT OF LIGHT COMING IN SIGNIFICANTLY AND CAN USE FILTERS DIRECTLY ON YOUR LAMPS OR BULBS AS WELL AND USE THEM AS PART OF YOUR EXHIBIT CASE.

THERE ARE DIFFERENT THINGS YOU CAN USE TO BLOCK UV BECAUSE OF THE INHERENT MATERIAL LIKE PLEXIGLASS.

NEXT.

DIMMERS.

SORT OF COMMON SENSE IT'S THE WAY TO CONTROL THE STRENGTH OF LIGHT BEING USED AND IF YOU HAVE A LIGHT METER YOU CAN SEE WHAT LEVEL YOU'RE AT AND MARK IT ON THE DIMMER SO YOU CAN SEE IT'S YOUR FIVE FOOT CANDLES IF YOU HAVE WATER COLORS ON DISPLAY AT THAT POINT.

YOU CAN ADJUST IT TO THAT IF YOU HAVE WATER COLORS AND MAKE A DIFFERENT MARK FOR A DIFFERENT ADJUSTMENT FOR SOMETHING ELSE, FOR CERAMICS OR SOMETHING. SOMETHING NOT QUITE AS LIGHT SENSITIVE.

NEXT.

ACTIVATED LIGHTING SYSTEM IS AWESOME.

THEY DON'T COME ON UNTIL SOMEONE

COMES IN THE ROOM.
IT'S AN EXPENSIVE OPTION BUT
GREAT FOR THINGS YOU'RE WORRIED
ABOUT IN TERMS OF LIGHT LEVELS.
LIGHT SENSITIVITY, TEXTILES,
THAT TYPE OF THING.
THOSE I RECOMMEND.
OKAY.
NEXT.
THE NEXT ONE GETS YOU INTO
RELATIVE HUMIDITY.
YAY.
>> I WANTED TO TAKE A BREAK TO
ANSWER SOME GREAT LIGHT RELATES
QUESTIONS.
THE LIGHT BULBS HAVE BEEN GOING
OFF, HA HA.
A COUPLE QUESTIONS ABOUT SLEEVE
IT'S YOU SEE THE QUESTIONS I
PULLED ASIDE.
>> I SEE.
>> THE NEW ENERGY EFFICIENT
BULBS, CAN YOU GET SLEEVES WITH
THOSE.
WE HAVE THE LINK YOU SHARED.
IS THAT A ONE-STOP SHOT FOR ALL
YOUR SLEEVE NEEDS?
>> THAT PARTICULAR PLACE DOES
MOSTLY LIGHTING FOR THEATRE,
BELIEVE IT OR NOT ACTUALLY.
SO IT'S MORE THEATRICAL
APPLICATIONS.
I DON'T KNOW OF SLEEVES FOR
COMPACT FLORESCENT LAMPS.
IT'S A BULBS A LOT OF PLACES
USE.
WE USE THEM HERE AT YALE AND
THEY'RE EVERYWHERE AND I TRIED
TO FIND SOMETHING APPLICABLE AND
WHAT YOU CAN DO IS WHEN YOU GO
TO CHOOSE A BULB YOU HAVE THE
MANUFACTURE'S SPECIFICATIONS AND
YOU CAN ACTUALLY READ NOW THAT I
TOLD YOU ABOUT THE SPECTRUM YOU
KNOW WHAT NANOMETERS WHAT THE
SPECTRA IS.
YOU CAN SAY IT RUNS FROM THAT

NANOMETER TO THAT ONE YOU'LL KNOW HOW MUCH OF IT IS GOING TO BE THE HIGHER ENERGY UV. IF YOU PICK UP A COMPACT FLORES ENTERS IT SAYS THE SPECTRUM RUNS FROM 200 TO 500 NANO METERS WOULD HAVE A LOT OF UV BECAUSE 400 OR 390 TO 180 IS THE UV SPECTRA YOU WANT SOMETHING CLOSER FOR EXAMPLE.

DOES THAT MAKE SENSE?

>> AND HOW OFTEN SHOULD YOU CHANGE SLEEVES ON FLORESCENTS?

>> THE RULE OF THUMB HAS BEEN TEN TO 15 YEARS SO IT IS QUITE A LONG TIME.

WHAT I REALLY WOULD RECOMMEND IS EITHER GETTING SOME HOW A PAINTING -- AN ULTRAVIOLET LIGHT METER WHETHER YOU BARROW ONE FROM SOMEBODY OR PURCHASE ONE YOURSELF BECAUSE THEY MAKE ONES. CALUS SELLS A UV METER AND IF YOU JUST TAKE LIGHT LEVEL MEASUREMENTS EVEN IF YOU DO IT ANNUALLY TO MAKE SURE THE SLEEVES ARE STILL WORKING IS PROBABLY YOUR BEST BET BUT IT'S USUALLY TEN TO 15 YEARS.

>> AND A LED BE USE IN A STANDARD HALOGEN FIXTURE?

>> I CAN'T REMEMBER.

I'M TRYING TO REMEMBER WHAT WE HAVE IN THE CASES.

NO, I DON'T THINK IT CAN.

>> OKAY.

I THINK WE'RE ALSO GETTING A QUESTION ABOUT THE FILTERING ON WINDOWS.

YOU'VE GOT THAT GOING ON. LET'S SEE, THE BUILDING HAS WINDOWS TREATED WITH UV FILTERING SHOULD THERE BE CONCERN ABOUT VISIBLE LIGHT DAMAGE.

>> YES.

UV FILTERING MEANS IT'S ONLY

FILTERING THE NANOMETERS 180 TO 390 YOU STILL HAVE TO WORRY UP TO 760.

IT WILL BE A DIFFERENT PART OF SPECTRA.

IF YOU SEE LIGHT COMING THROUGH THERE'LL BE VISIBLE LIGHT DAMAGE BUT NOT AS HIGH DAMAGE AS IF IT WERE THE UV BUT ALL TYPES OF DAMAGE WILL BE A CONCERN.

>> AND HOW OFTEN SHOULD YOU CHECK LIGHT LEVELS.

ALL THINGS BEING EQUAL --

>> YEAH, ANYTIME YOU CHANGE AN EXHIBIT OUT SO IF YOU'RE GOING TO REFOCUS YOU'RE LIGHTS AND THINGS LIKE THAT YOU WANT DO THAT.

IF YOU CHANGED YOUR BULBS AT ANY POINT, YOU WANT TO CHECK YOU'RE LIGHT LEVELS OTHERWISE THEY CAN BE DONE QUARTERLY FOUR TIMES A YEAR.

THAT'S USUALLY THE RECOMMENDATION I MAKE.

>> OKAY.

A LOT OF GOOD QUESTIONS COMING IN SO FAST IT'S HARD TO PUBLISH THEM.

LET'S SEE.

USER-ACTIVATED MOTION SENSORS. DO YOU LIKE THEM?

>> I DO IN THE APPLICATIONS I USE THEM IN I FIND THEM HELPFUL PROVIDED THEY'RE INSTALLED PROPERLY.

I LIKE THEM FOR -- LIKE, THERE'S AN EXAMPLE OF PERMANENT EXHIBITS WE HAVE THINGS ON PERMANENT EXHIBIT AND THEY'RE HELPFUL BECAUSE THE LIGHT ISN'T RECEIVING LIGHT CONSTANTLY.

IT'S ONLY GETTING LIGHT CAST UPON IT WHEN THERE'S A VISITOR PRESENT LOOKING AT THE ITEM.

I LIKE IT FOR THAT REASON.

IT'S -- WHAT WAS THE QUESTION

EXACTLY?

>> SOMEONE SUGGESTED IT AS AN OPTION AND SOMEONE ELSE COMMENTED THEY DON'T FIND IT ACCURATE.

>> IT HAS TO BE SET UP CORRECTLY AND DEPENDING ON HOW CLOSE SOMEONE NEEDS TO GET IT MAY NEED TO BE ADJUSTED.

>> WE HAD A GREAT QUESTION IN SUNNY HAWAII WHERE THEY HAVE A WALL FULL OF WINDOWS WHICH I WOULD WANT IF I WAS IN HAWAII AND THIS IS AN ELABORATE QUESTION BUT TO PUT FILTERING ON WINDOWS IT'S PROBABLY A JOB FOR A PROFESSIONAL.

THAT'S A QUESTION.

>> I WOULD RECOMMEND THAT SIMPLY BECAUSE APPLYING FILMS TO GLASS CAN BE TRICKY.

ESPECIALLY IF YOU'RE TALKING ABOUT WINDOWS IN AN HISTORIC STRUCTURE AND THEY'LL HAVE A WIDER VARIETY OF FILMS TO CHOOSE FROM.

I FOUND WHERE I DID THIS BEFORE WORKING WITH COMPANIES WHERE THEY APPLIED FILMS TO EXHIBIT CASES IN LESS THAN IDEAL PLACES AND THEY CAN GIVE YOU DIFFERENT RANGES OF DARKNESS SO YOU CAN IT FILTER OUT MORE LIGHT OR LESS LIGHT DEPENDING ON HOW MUCH LIGHT IS COMING INTO THE SPACE. YOU CAN ALSO, IF YOU HAVE THE WINDOWS FILTERED FOR ONE LEVEL AND YOU CAN ALWAYS HAVE A FRAMED OBJECT LIKE SOMETIMES PLACES PUT VELVET DRAPES OVER THINGS AND THE PEOPLE VISITING CAN LIFT IT. THAT'S ONE WAY TO PROTECT THEM AS WELL.

>> RIGHT.

THAT'S A NICE OPTION TOO. FOR SAVING HISTORIC PRODUCTS ESPECIALLY HOMES WITH PAPER

WORKS ON DISPLAY IN CABINETS
THEN THAT'S IDEAL AND PRETTY
COST EFFECTIVE I WOULD SAY
TOO.

I JUST HAVE A COUPLE MORE.
I DON'T WANT TO GET YOU BEHIND
WITH OTHER SECTIONS TO GO.
A CONSERVATOR MENTIONED USING
WINDOW SCREEN IN A FLORESCENT IS
A HELPFUL WAY TO PRODUCE UV.
I KNOW THERE'S LOTS OF INTEREST
IN LOW-COST SOLUTIONS.

>> WINDOW SCREENS?

I DON'T SEE HOW TO WOULD REDUCE
ULTRAVIOLET LIGHT BUT VISIBLE
LIGHT.

DEPENDING ON HOW TIGHTLY WOVEN
THE SCREEN IS.

YOU KNOW WHAT SHE'S THINKING OF,
THERE IS -- I CAN'T REMEMBER THE
NAME OF IT BUT THERE'S A FLORIST
GREENHOUSE MATERIAL TO REDUCE
ULTRAVIOLET LIGHT THAT HAS
SOMETHING TO DO WITH GREENHOUSES
OR SOMETHING LIKE THAT AND I
DON'T REMEMBER WHAT IT ACTUALLY
IS BUT IT DOES LOOK LIKE
SCREENS.

IT LOOKS LIKE A SCREENING
MATERIAL.

MAYBE THAT'S WHAT THEY MEANT BUT
A SCREEN BY ITSELF MAY REDUCE
VISIBLE LIGHT BUT THAT'S ABOUT
IT.

I CAN'T SEE HOW IT WOULD REDUCE
UV.

WE CAN LOOK INTO THAT AND FIND
OUT.

I CAN FIND OUT ABOUT THAT.

>> I SEE A LOT OF COMMENTS BACK
AND FORTH WITHIN THE GROUP I
DON'T THINK WE GOT THROUGH ALL
THE QUESTIONS.

I'LL SCAN THEM LATER AND MAKE
SURE THEY GET ANSWERED AND I'LL
TURN IT OVER TO YOU TO GET ON
WITH HUMIDITY.

>> COOL.

THANK YOU.

SO RELATIVE HUMIDITY AND
TEMPERATURE.

SO WHAT IS RELATIVE HUMIDITY?
I'LL START BY MENTIONING TALK
ABOUT WATER.

WATER CAN EXIST AS ICE, LIQUID
OR AS A GAS SUCH AS VAPOR.

NEXT.

SO ABSOLUTE HUMIDITY WHICH IS
JUST HUMIDITY WHEN YOU SAY THE
TERM HUMIDITY IS THE AMOUNT OF
WATER VAPOR IN A GIVEN VOLUME OF
AIR.

NOW THAT'S NICE TO KNOW BUT IT'S
NOT HELPFUL TO US BECAUSE SINCE
THE AMOUNT OF WATER IN THE AIR
WILL DEPEND ON THE TEMPERATURE.
WE'D RATHER KNOW THAT.

NEXT.

>> RELATIVE HUMIDITY IS AMOUNT
OF WATER VAPOR IN A GIVEN AREA
RELATIVE TO THE AIR.

THAT'S THE DIFFERENCE BETWEEN
HUMIDITY AND RELATIVE HUMIDITY.
THE RELATIVE BASICALLY MEANS
IT'S RELATIVE TO THE TEMPERATURE
OF THE AIR, MEANWHILE ABSOLUTE
INVESTMENT IS THE WATER VAPOR IN
THE AIR REGARDLESS OF
TEMPERATURE.

NEXT.

SO WHAT IS DEW POINT?

DEW POINT IS THE MAXIMUM AMOUNT
OF WATER HELD IN THE AIR GIVEN A
CERTAIN TEMPERATURE.

IT'S CALL THE DEW POINT AND ALSO
CALLED THE SATURATION POINT.

AT THAT POINT MOISTURE WILL
CONDENSE OUT OF THE AIR.

I FOUND THIS GREAT VIDEO FROM A
METEOROLOGIST IN MILWAUKEE NAMED
VINCE WHO ACTUALLY DOES A VERY
GOOD JOB EXPLAINING RELATIVE
HUMIDITY SO I'M GOING TO LET THE
MAN WITH THE LITTLE HAT ON TELL

YOU ALL ABOUT IT.

>> IT'S MORE THAN 50% OF THIS
HEY

>> HEY, EVERYBODY, VINCE CONDELA
WITH FOX 6.

CAN YOU FEEL THE MOISTURE IN THE
AIR YOU CAN FEEL IT WHEN YOU
HAVE A COLD GLASS OF WATER ON A
HUMID DAY IT CHILLS DOWN TO THE
DEW POINT AND THE MOISTURE IN
THE AIR CONDENSES OUT TO THE
SIDE OF THE GLASS.

THERE'S THE CONCEPT.

DEW POINT.

SO MANY PEOPLE ARE CONFUSED.
THEY LIKE RELATIVE HUMIDITY
BECAUSE THEY'VE ALWAYS HEARD
THAT CONCEPT BUT DON'T
UNDERSTAND DEW POINT.

HERE'S ONE WAY TO THINK ABOUT IT
THE TEMPERATURE THE AIR NEEDS TO
COOL TO FOR THE WATER TO
CONDENSE.

IF I CAN DROP THE TEMPERATURE
DOWN TO THE DEW POINT ANY IN
VISIBLE MOISTURE IN THE AIR WE
CAN MAKE VISIBLE AND CONDENSE IT
OUT.

HERE'S ANOTHER WAY TO THINK
ABOUT RELATIVE HUMIDITY, IT'S
RELATIVE TOTAL ACTUAL AIR
TEMPERATURE.

SO CONSIDER THESE TWO BOXES.
THEY'RE VERY DIFFERENT IN SIZE.
THIS WOULD BE REPRESENTATIVE OF
VERY WARMER AND HOLDS A LOT OF
MOISTURE.

THAT'S CAPACITY TO HOLD A LOT OF
MOISTURE.

THIS REPRESENTATIVE OF COLD AIR.
IT CAN'T HOLD AS MUCH MOISTURE
AS WARM AIR CAN.

WELL RELATIVE HUMIDITY IS
RELATIVE TO THE ACTUAL AIR
TEMPERATURE.

SAY IF THE RELATIVE HUMIDITY IS
50%, WELL, THAT MEANS HALF OF

THE AIR IS FILLED WITH IT'S
CAPACITY WITH WATER VAPOR.
50% OF THIS IS MORE THAN 50% OF
THIS.

SO A 50% RELATIVE HUMIDITY ON A
WARM DAY IS A LOT MORE MOISTURE
IN THE AIR THAN 50% RELATIVE
HUMIDITY ON A COOL DAY.

SO AGAIN, RELATIVE HUMIDITY IS
RELATIVE TO THE AIR TEMPERATURE
AND IT DIFFERS DEPENDING ON THE
ACTUAL TEMPERATURE OF THE AIR.
THE BETTER MEASURE IS DEW POINT.
BY THE WAY, DEW POINT'S A GREAT
MEASURE FOR COMFORT ABOVE 60
GETS STICKY AND UNCOMFORTABLE.
DEW POINT REPRESENTATIVE OF THE
MOISTURE IN THE AIR TO RELATIVE
HUMIDITY.

SEE YOU ON FOX 6 NEWS.

GREAT, THANKS.

HOPEFULLY THAT CLEARED SOME
QUESTIONS UP.

I REALLY WANTED TO DEMONSTRATE
THE BOX EXAMPLE.

A GREAT WAY OF DEMONSTRATING
VOLUME OF AIR AND I CAN'T DO
THIS IN TECH LAND SO I'M
GRATEFUL TO VINCE AND HIS VIDEO
SERIES TO DEMONSTRATE THAT.

I'LL TALK ABOUT DIFFERENT WAYS
TO MEASURE RELATIVE HUMIDITY.
ACTUALLY, A HAIR HYDROMETER IS
THE GOLD STANDARD FOR MEASURING
RELATIVE HUMIDITY AS EVERYBODY
KNOWS AND THIS WOMAN IS
DEVELOPING BY FRIZZY HAIR.
IT WAS DEVELOPED BACK IN THE
18th CENTURY.

WE'VE BEEN USING IT A LONG TIME
AND IT WORKS QUITE WELL.

NEXT, INDICATING CARDS.

SO HOW THESE WORK YOU PROBABLY
HAVE SEEN A NUMBER OF THESE IN
PLACE.

THEY CAN TAKE SALT SOLUTIONS AT
DIFFERENT HUMIDITY.

THE WAY YOU'D READ THIS PARTICULAR CARD IS READ BETWEEN THE PINK AND BLUE.

SO WHERE IT'S ALMOST PINK ALMOST BLUE IS IN THIS PARTICULAR CARD YOU'RE LOOKING AT NOW WOULD BE PROBABLY CLOSE TO THE 20% RANGE WHICH IS PRETTY DRY.

SO THE CARD'S BEEN HANGING OUT IN A DRY PLACE APPARENTLY.

NEXT.

A WAY TO MEASURE RELATIVE HUMIDITY AND DEW POINT IS PSYCHROMETER.

IT'S SO MUCH MORE ENTERTAINING BECAUSE YOU CAN STAND AND SWING IT AROUND AND A GRADE SCHOOL KID DOES A GREAT DEMONSTRATION OF IT SO ANOTHER VIDEO.

SORRY.

HE DOESN'T HAVE A HAT BUT HE'S A CUTE KID SO ENJOY.

>> HI, TODAY I'LL BE SHOWING YOU HOW TO FIND RELATIVE HUMIDITY USING A PSYCHROMETER.

THIS IS THE WET PART BECAUSE THERE'S A SOCKET RIGHT THERE AND ON THE DRY SIDE THERE'S JUST A REGULAR BULB.

SO FIRST THING YOU DO IS YOU DIP IT IN THE WATER AND THEN YOU SLING IT FOR ABOUT ONE MINUTE LIKE THIS.

OKAY.

SO ABOUT ONE MINUTE HAS PASSED.

OUR WET BULB IS 16 DEGREES CELSIUS AND THE DRY BULB IS ABOUT 22 DEGREES CELSIUS.

MAKE SURE YOU MEASURE ON CELSIUS ON THIS SIDE AND NOT IN FAHRENHEIT.

SO WHEN YOU HAVE THE DEGREE GO TO PAGE 12 OF THE TABLES AND YOU SEE THE DRY BULB IS 22.

GO DOWN TO 22 OVER HERE ON THE RELATIVE HUMIDITY CHART.

SINCE THE BULB WAS 16 IT HAS A

DIFFERENCE OF 6 SO SIX AND YOU HAVE TO MOVE IT OVER WHEN YOU SEE IT'S 53%.

THE RELATIVE HUMIDITY USING THE RELATIVE HUMIDITY CHART AND 20 DEGREE DRY BULB AND 16 DEGREE WET BULB IS 63%.

THAT'S IT.

>> GREAT, THANKS.

SO ANOTHER WAY TO RELATIVE RELATIVE HUMIDITY AND TEMPERATURE YOU'VE PROBABLY SEEN THESE IN A VARIETY OF INSTITUTIONS.

IT RECORDS DATA WHICH IS TEMPERATURE AND RELATIVE HUMIDITY OVER TIME TO SHOW TRENDS ON A PIECE OF PAPER THAT IS YOU CAN SEE THERE ON THE ROLL.

YOU CAN USUALLY DO THEM EITHER WEEKLY OR MONTHLY DEPENDING UPON HOW LONG YOU WANT TO HAVE THE HYGROTHERMOGRAPH WORKING.

THERE'S AN ELECTRONIC WAY TO GATHER TEMPERATURE AND INFORMATION THAT INVOLVES COMPUTER SOFTWARE TO INTERPRET AND GRAPH DATA.

WHAT I'M SOMETHING ON THE RIGHT-HAND SIDE IS THE PRESERVATION ENVIRONMENTAL MONITOR.

THEY'RE ONE OF THE LEADERS IN CREATING TOOLS FOR ENVIRONMENTAL MONITORING AND INTERPRETATION.

I SAW EARLY ON PEOPLE WERE TALKING ABOUT THE E-CLIMATE NOTEBOOK WHICH IS ACCIDENT FOR INTERPRETING DATA.

WE USE IT AT YALE AND USE IT OR ALL OUR LIBRARIES AND IT'S VERY HELPFUL.

I DO HIGHLY RECOMMEND IT.

NEXT.

THE RECOMMENDED LEVELS, ONE THING I WANT TO STRESS IS THE

LACK OF FLUCTUATION WITHIN A RANGE IS THE MOST IMPORTANT FACTOR.

I THINK IN YEARS PAST PEOPLE HAVE BEEN STUCK ON THE TEMPERATURE NEEDS TO BE THIS AMOUNT ALL THE TIME AS THE RELATIVE HUMIDITY NEEDS TO BE THIS AMOUNT ALL THE TIME. THAT REALLY ISN'T THE CASE. RESEARCH IS FINDING THAT WITH TEMPERATURE OF COURSE LOWER IS BETTER PROVIDED THAT YOU CAN KEEP YOUR RELATIVE HUMIDITY STEADY BUT KEEPING IT WITHIN A RANGE IS PERFECTLY ACCEPTABLE AND SAME WITH RELATIVE HUMIDITY SO I GIVE A RANGE OF 30% TO 55%. YOU CAN DO PLUS OR MINUS FIVE PERCENT IF YOU HAVE THAT KIND OF CONTROL BUT IF YOU HAVE GRADUAL CHANGES THROUGH THE SEASON THAT'S EXPECTED AND TOTALLY NORMAL AND THAT'S OKAY.

MOST MATERIALS CAN HANDLE THAT SORT OF THING ESPECIALLY WHEN IT COMES TO LIBRARIES AND ARCHIVE. WE'RE LUCKY IN THAT A LOT OF WHAT WE HAVE IS PAPER BASE AND HYDROSCOPIC MATERIAL AND ABSORB WATER EASILY WITHOUT ANY SORT OF DAMAGE.

THAT'S WHY WE CAN DO THAT SORT OF RANGE.

SOMETHING LIKE VENEERED WOODS, COMPOSITE OBJECTS, THINGS LIKE THAT YOU MAY WANT TO INTEREST TIGHTER ENVIRONMENTAL CONTROLS BUT IT WILL DEPEND ON YOUR OBJECTS.

FOR TEMPERATURE SET POINTS WE LIKE TO SAY NO HIGHER THAN 70 DEGREES IF POSSIBLE.

OBVIOUSLY LOWER IS BETTER.

THE LOWER YOU CAN MAKE YOUR TEMPERATURE THE SLOWER CHEMICAL REACTIONS WILL HAPPEN.

THAT'S WHY A LOT OF -- WE
RECOMMEND FOR A LOT OF DIFFERENT
THINGS, COLD STORAGE BEING IDEAL
FOR A LOT OF DIFFERENT MATERIALS
LIKE PLASTICS, FILM, NEGATIVES
THAT, THAT SORT OF THING.

SOME TEXTILES IT'S A GOOD IDEA
AND SOME ASKED ABOUT RUBBER IN
COLD STORAGE.

YES, IT WITH ABSOLUTELY SLOW
DOWN DEGRADATION THAT WOULD BE
HAPPENING WITH RUBBER-BASED
MATERIALS.

THAT IS A GOOD CHOICE.

YOU WANT TO THINK BAY RANGE AND
WHAT YOU'RE BUILDING CAN TAKE,
WHAT YOUR COLLECTIONS ARE AND
WORK WITHIN THERE RATHER THAN
LOOKING FOR AN EXACT TEMPERATURE
AND RELATIVE HUMIDITY.

AT THE END OF THE PROGRAM
THERE'S A LIST OF THE WEBSITE
YOU CAN GO TO.

THERE'S A VARIETY OF FREE
WEBINARS THEY'LL BE GIVING ABOUT
THE COLLECTION DEPARTMENT I
HIGHLY, HIGHLY RECOMMEND YOU
TAKE THEM IN LEARNING ABOUT YOUR
COLLECTIONS.

THEY'LL BE REALLY VALUABLE TO
YOU.

NEXT.

SO WE TALKED ABOUT THIS
YESTERDAY.

HOW DOES THE ENVIRONMENT AFFECT
YOUR COLLECTIONS.

THERE'S THREE DIFFERENT AFFECTS
ON ENVIRONMENTAL INFLUENCES.

PHYSICAL, CHEMICAL AND
BIOLOGICAL.

NEXT.

SO SOME PHYSICAL THINGS THAT CAN
HAPPEN WITH EXTREME CHANGES IN
TEMPERATURE AND RELATIVELY
HUMIDITY, OFTEN AND CONSTANT YOU
CAN HAVE THINGS THAT WILL CHANGE
SIZE AND SHAPE.

ALL ORGANIC MATERIALS WILL ABSORB WATER WHEN RH INCREASES AND SHRINK WHEN RH DECLINES STARTING ON THE OUTSIDE OF THE MATERIAL WORKING TOWARDS THE INSIDE.

WHAT I'VE SEEN HERE IS CRACKING EMULSIONS ON A PHOTOGRAPH. FOR SOME THINGS IF YOU HAVE A LOT OF TEMPERATURE AND RELATIVE HUMIDITY CHANGE HAS IT HAPPEN QUICKLY AND OFTEN YOU CAN HAVE MATERIALS THAT WILL END UP CRACKING ESPECIALLY IF IT'S A COMPOSITE MATERIAL LIKE A PHOTOGRAPH AND IF IT GETS TOO DRY IN A SPACE YOU'RE VELUM CAN START TO PULL AWAY AND THEN THE BINDING NEEDS TO BE REHUMIDIFIED TO GET THE BINDING TO RELAX AND CLOSE AGAIN OTHERWISE IT NEEDS TREATMENT.

YOU CAN'T FORCE IT BACK DOWN WITHOUT TEARING THE BINDING UNFORTUNATELY AND THAT WAS CAUSED BY A DRASTIC DROP OF RELATIVE HUMIDITY IN THIS PARTICULAR INSTANCE WITH THE BINDING.

SOME CHEMICAL EXAMPLES. SPEED OF CHEMICAL REACTS THAT CAN CAUSE ACIDIC DEGRADATION. A SIMPLE RULE OF THUMB IS CHEMICAL REACTS DOUBLE WITH EACH 18 DEGREES IN FAHRENHEIT OR TEN DEGREE CELSIUS AND 9 DEGREES FAHRENHEIT NEARLY DOUBLE WILL THE RATE OF DETERIORATION AND RELATIVE HUMIDITY PROVIDES MOISTURE TO FUEL THE REACTION. THE HIGHER THE RELATIVE HUMIDITY THE MORE QUICKLY DETERIORATION PROCEEDS.

SO SULFUR DIOXIDE IN THE AIR ENDS UP BEING A CORROSIVE REACTION AND RELATIVE HUMIDITY CHANGES THE SILVER COMPONENT OF

THE EMULSION OF THE PHOTOGRAPHIC ELEMENT.

IT CHANGES BACK TO ELEMENTAL SILVER WHICH IS WHY IT HAS THE SHINY APPEARANCE.

WHEN YOU HAVE A PHOTOGRAPH WITH A DIFFERENT CHEMICAL COMPOSITION AND IT COMBOS BACK TO SHINY COMPONENT WHICH IS WHY THAT DUDE'S HAIR LOOK SHINY AND PLASTIC.

NEXT.

BIOLOGICAL.

THIS IS MOSTLY MODEL WHICH I'LL BE TALKING ABOUT NEXT WEEK EXTENSIVELY.

THE EXAMPLE ON THE LEFT ONE THING AND THE RIGHT IS STARCH CLOTH EATEN BY INSECTS.

INSECTS REALLY LIKE HIGH TEMPERATURES AND HIGH RELATIVE HUMIDITY.

SO THE HIGHER RELATIVE HUMIDITY THE MORE LIKELY YOU'RE GOING TO ATTRACT PESTS LIKE INSECTS.

SO CONTROLLING RELATIVE HUMIDITY AND TEMPERATURE.

SO SOME THINGS I LIKE TO TALK ABOUT ARE LOWER COST OR NO-COST WAYS TO IMPROVE CONDITIONS.

KEEPING YOUR WINTER HEAT LOW IS IMPORTANT IN THAT YOUR HEATING BILL WON'T BE SO HIGH BUT ALSO WHEN WE OVERHEAT OUR BUILDINGS WE CAN START TO DRY OUT PLACES AND THAT'S BAD WITH PLACES RELATIVE HUMIDITY LOW AND TEMPERATURE AND RELATIVE HUMIDITY HAVE AN INVERSE RELATIONSHIP SO WHEN YOU RAISE THE TEMPERATURE THE RELATIVE HUMIDITY GOES DOWN.

WHEN YOU LOWER YOUR TEMPERATURE, THE RELATIVE HUMIDITY GOES UP.

SO KEEPING YOUR WINTER HEAT LOWER THAN I NORMALLY WOULD MEANS THE RELATIVE HUMIDITY

WON'T DROP DRASTICALLY.
THAT'S REALLY IMPORTANT.
AND SAME GOES FOR SUMMER
TEMPERATURES.

IF YOU CAN KEEP YOUR SUMMER
TEMPERATURES A LITTLE HIGHER
YOU'RE GOING KEEP YOUR SPACES A
LITTLE DRIER AND I'M TALKING
ABOUT SPACES WHERE YOU DON'T
HAVE A LOT OF R RELATIVE
HUMIDITY CONTROL.

THIS IS THE WAY TO DO SOME -- SO
HELP SOMEWHAT.

PEOPLE ASKED ABOUT
DEHUMIDIFIERS.

THEY ARE AN EXCELLENT WAY TO
CONTROL IT BUT YOU WANT TO MAKE
SURE IT'S THE RIGHT SIZE FOR
YOUR SPACE AND REMOVE THE RIGHT
AMOUNT OF MOISTURE FROM THE AIR.
I INCLUDED LINKS ON THE WEBSITE
FOR CONNECTING TO COLLECTIONS.
IT WILL HELP WITH CHOOSING THE
RIGHT TYPE OF DEHUMIDIFIER.
AND THE IMAGE AT THE INSTITUTE
IS DOING EXPERIMENTS WITH
LIBRARIES AND ARCHIVES WHERE WE
ARE SHUTTING DOWN OUR HV-AC
SYSTEMS TO SEE HOW TO AFFECTS
THE OVERALL INDEX OF PAPER
MATERIALS AND SO FAR IT'S BEEN
WORKING WELL.

WE'VE BEEN TURNING OFF -- LIKE
TURNING OFF THE HEATING AND
VENTILATION AND COOLING SYSTEMS
ALL TIMES OF YEAR AND FINDING
THE RELATIVE HUMIDITY SHIFTS ARE
REALLY MINIMAL.

THAT'S A REALLY GOOD THING.

WE'VE BEEN TALKING ABOUT IT FOR
YEARS AND YEARS YOU NEED TO KEEP
YOUR TEMPERATURE -- THE SAME
TEMPERATURE ALL THE TIME.

NOT NECESSARILY.

SO KEEP YOU'RE EYES PEELED FOR
THAT AND THAT'S STUFF YOU CAN
LEARN FROM THE FREE WEBINARS

FROM THE PERMANENT INSTITUTE.
SEALING WINDOWS.
IT'S IMPORTANT.
IF YOU NEED TO SEAL THEM UP WITH
PLASTIC IN SOME CASES THAT'S
IMPORTANT TO KEEP COLD AIR OUT
AND HOT AIR OUT.
KEEPING OUTSIDE DOORS AND
WINDOWS CLOSED.
I KNOW SEEMS LIKE COMMON SENSE
BUT SOMETIMES YOU NEED THESE
SORTS OF THINGS.
BLOCKING HEAT FROM RADIATORS TO
KEEP THE RADIANT HEAT AWAY FROM
A COLLECTION IS IMPORTANT TOO.
AND SEPARATE COLLECTIONS THAT
NEED SPECIAL CONDITIONS.
THE NEXT SLIDE.
MICROCLIMATES SOMETHING IN PAPER
HOUSING INSIDE A BOX AND ANOTHER
BOX.
THE MORE LAYERS OF PROTECTION
YOU HAVE IN TERMS OF HOUSING
FROM OUTSIDE ENVIRONMENT WILL
MAKE A DIFFERENCE IN HOW IT
AFFECTS YOUR OBJECT.
REMEMBER I MENTIONED TEMPERATURE
AND RELATIVE HUMIDITY ESPECIALLY
AFFECTS AN OBJECT FROM THE
OUTSIDE IN.
IF IT'S COMING AT YOUR OBJECT
AND HAS TO COME OUT SIDE A
FOLDER AND HOUSING IT WILL TAKE
A FAR LONGER PERIOD OF TIME FOR
THE RELATIVE HUMIDITY CHANGE TO
AFFECT YOUR OBJECT SO HOUSING'S
REALLY IMPORTANT.
ALSO THINGS LIKE EXHIBIT CASES,
STORAGE AREAS, SHIPPING
CONTAINERS, PACKAGES, ALL CAN BE
CONSIDERED MICROCLIMATE.
SILICA GEL IS A GLASS-BASED
PRODUCT AND IT CHANGES COLOR
WHEN IT NEEDS TO BE RE FRESHED.
YOU DON'T WANT TO USE ONE THAT
ARE INDICATORS MADE OF COBALT
WHICH IS BLUE BECAUSE IT'S A

TOXIC METAL STICKING WITH YELLOW
OR ORANGE AND FOR OUR
CLOSED-CASE CONTAINER 20
MILLIGRAMS IS SUFFICIENT FOR A
YEAR TO KEEP IT STABLE.

NEXT.

THERE'S SOMETHING CALLED
SATURATED SALT BUT THAT'S NOT
SOMETHING I RECOMMEND BECAUSE
THERE'S PROBLEMS WITH RUSTING
METAL SO IGNORE THE SECOND
BULLET.

THE OTHER IS IMPORTANT WHICH IS
SOMETHING I MENTIONED EARLIER
WHICH IS BUFFERING WITH LAYERS.
IF EVERY LAYER YOU HAVE ABOVE
YOUR OBJECT PROTECT IT.

WHAT I'M SHOWING IS A FRAMING
PACKAGE AND ALL THE DIFFERENT
LEVELS THAT PROTECT YOUR OBJECT
FROM BOTH SIDES WILL PROTECT IT
FROM THE OUTSIDE ENVIRONMENT.
SO KEEP IN MIND THAT ONLY ACID
FREE MATERIALS TOUCH THE OBJECT
ITSELF AS IT SHOWS IN THIS
FRAMING PACKAGE IMAGE.

THE MORE MATERIALS IN THE
PACKAGE THE BETTER PROTECTED IT
IS FROM THE OUTSIDE ENVIRONMENT.
OKAY.

WE'RE AT POLLUTANTS SO I CAN
PAUSE AGAIN AND ANSWER SOME
QUESTIONS COMING UP ON THE LEFT
HAND SIDE HERE.

>> THANKS, SO MUCH TARA.

WE HAVE ABOUT 20 MINUTES.

I WANT TO KEEP AN EYE ON TIME.

I PUT IN A COUPLE MORE
LIGHT-RELATED QUESTIONS MAYBE WE
CAN ANSWER THOSE AT THE END IF
WE HAVE TIME.

I WANT TO GET MORE ON RH.

SO YOU SEE QUESTION HERE'S.

WANT ME TO READ THEM OUTLOUD?

>> ROBERT WANTS TO KNOW

>> A DESICCANT WHEEL IS A GOOD
WAY OF REDUCING RELATIVE

HUMIDITY.

WHAT I RECOMMEND FOR THINGS LIKE THAT A DESICCANT WHEEL IS ONLY EFFECTIVE IN A PURPOSE BUILDING BECAUSE YOU'LL HAVE A GOOD VAPOR BARRIER AND GOOD INSULATION.

A LOT OF HOLDER HOMES LIKE THAT YOU END UP DRYING THE OUTSIDE AND MAY CAUSE PROBLEMS TO THE HISTORIC ITEM AND WE USE THEM IN STORAGE FACILITY AND IT MAINTAINS 35% RELATIVE HUMIDITY YEAR-ROUND, FLATLINE.

>> GREAT.

AND WHAT'S THE BEST EQUIPMENT TO BALANCE HUMIDITY.

I THINK YOU HIT ON THAT AT THE END.

MICROCLIMATES.

>> YOU IF YOU'RE TALKING ABOUT HIGH LEVEL OF HUMIDITY, A DEHUMIDIFIER PROBABLY.

IT DEPENDS ON WHAT KIND OF PROBLEMS YOU'RE HAVING IF YOU'RE HAVING LOW RELATIVE HUMIDITY, YOU MAY NEED A HUMIDIFIER AND IF IT'S HIGH A DEHUMIDIFIER AND IF YOU'RE PROJECTING YOUR OBJECTS IF YOU HAVE NO WAY TO USE EQUIPMENT LIKE THAT IT'S BEST TO TRY TO DO REALLY GOOD HOUSING BUT USUALLY I RECOMMEND HUMIDIFIERS AND DEHUMIDIFIERS.

>> YOU DID PUT A RESOURCE UP ON THE WEB PAGE ON HOW YOU DETERMINE THE SIZE OF HUMIDIFIER DEPENDING ON THE SIZE IN THE SPACE.

ANYTHING MORE TO ADD BESIDES CHECK OUR SOURCES.

>> THEY'RE TWO REALLY GOOD SOURCES AND MAKE IT PRACTICAL TO FIGURE IT OUT.

TOTALLY LOOK AT THOSE.

>> AND A QUESTION FROM ALASKA YESTERDAY LOW HUMIDITY IS A CHALLENGE THERE AND YOU SAY USE

HUMIDIFIERS.

IS THERE A VARIETY OF WHAT'S
AVAILABLE OUT THERE?

IS THERE SOMETHING MORE
HIGH-QUALITY FOR A COLLECTIONS
ENVIRONMENT?

>> IN TERMS OF HOW THE HUMIDITY
IS DELIVERED IT CAN VARY.
SOME ARE ASPIRATING WATER AND IT
DEPENDS ON HOW ENERGY EFFICIENT
YOU WANT TO BE AND HOW BIG OR
LIGHT YOUR SPACE IS.

THERE ARE DIFFERENT FACTORS.
WHERE I LIVE IT'S HIGH HUMIDITY
NOT LOW SO THAT'S WHAT I'VE
FOCUSSED ON BUT LET ME SEE IF
THERE'S A GOOD SOURCE TO CHOOSE
A HUMIDIFIER.

SOME PEOPLE NAILED IT, THAT'S
THE SCREEN FROM A GREEN IT IS
HOUSE TO BLOCK THE UV.

>> WE'LL SEE IF WE CAN FIND OUT
MORE INFORMATION ON THAT AND
POST IT ON THE SIGHT
YOU MENTIONED DESICCANT LIGHT.
CAN YOU EXPLAIN MORE.

>> OH, DESICCANT WHEEL.
SURE.

WHAT A DESICCANT WHEEL IS
LITERALLY A GIANT WHEEL FULL OF
A TYPE OF MATERIAL THAT IS
DRYING.

IT CAN BE LIKE SILICA GEL.
THAT SORT OF THING.

WHAT IT DOES IS IT ROTATES
THROUGH THE AIR STREAM AND ADDS
DRY AIR INTO A SPACE AND
AUTOMATICALLY RE FRESHES ITSELF
BY GOING OVER A HEATED ELEMENT
AND DRIES OUT THE DESICCANT IN
THE WHEEL AND THEN SO IT'S
USEABLE AGAIN.

IT'S ALMOST AN ONGOING RESOURCE
THAT CAN BE USED FOR A LONG
TIME.

IT'S VERY NICE BUT VERY
EXPENSIVE BUT IT'S A ROCKING

THING.

>> COOL.

CLAUDIA HAD A QUESTION FROM TEXAS.

SHE SAID OUR AREA OFTEN HAS DRY OUT DOOR AIR IS THERE AN INDOOR TO RANGE FOR.

>> 30%.

YOU GO ABOVE 55% YOU GO WORRY ABOUT MOLD.

YOU GO BELOW 30 YOU WORRY ABOUT DRYING THINGS OUT ESPECIALLY IF YOU HAVE VELUM IN YOUR COLLECTION IT'S IMPORTANT TO KEEP THE RELATIVE HUMIDITY UP HIGHER BUT IF IT'S MOSTLY PAPER YOU MAY GET AWAY WITH 25 BUT I USUALLY SAY 30.

>> AND I'LL LET YOU GO ON.

WE HAVE QUESTIONS ABOUT THE SILVER MARRYING AND QUESTIONS THAT TALKED ABOUT POLLUTANTS. I THINK YOU MIGHT ANSWER THEM IN THE NEXT SECTION AND SEE WHAT WE CAN CLEAR UP BY THE END.

THANKS.

>> THANK YOU.

>> OKAY, POLLUTANTS.

NEXT SLIDE, PLEASE.

SO THERE'S A COUPLE TYPES WITH AIRBORNE AND GASES.

THERE'S PARTICULATES AND THEY'RE MOSTLY FROM INDUSTRIAL.

CIGARETTE SMOKE AND THE PICTURE I HAVE IS A MICROSCOPIC SHOT.

SOME MEASUREMENTS AND STANDARDS MATTERS ARE IN MICRONS SO LARGER THAN 25 TO 20 WILL SETTLE AND SMALLER ONES FLOAT AROUND UNTIL THEY ARE CAUGHT IN SOMETHING AND IT'S MEASURED IN MICROGRAMS PER

CUBIC METER.

SO CONTROL.

MULTI-STAGE FILTRATION IS A GOOD WAY TO FILTER AND WHAT YOU WANT TO LOOK FOR THE MINIMUM

EFFICIENCY REPORTING VALVE OR THE MERV VALUE.

YOU HAVE TO MAKE SURE THE AIR-HANDLING SYSTEM CAN HANDLE HIGHER LEVELS OF FILTRATION OR YOU'LL BLOCK AIR FLOW.

THERE'S A LINK TO A CHART TO GIVE YOU THE MERV FILTRATION RATING SYSTEMS.

IT WILL GIVE YOU AN IDEA HOW MUCH TO FILTER OUT BUT THE MORE YOU CAN FILTER OUT THE BETTER IN FILTERS IN TERMS OF DUST AND AIRBORN PARTICULATE.

NITROUS OXIDE AND RAIN IS AN ACIDIC COMPONENT AND OZONE BREAKS DOWN THE RUBBER QUICKLY FROM THE SMOG.

SO THERE'S ALSO FORMALDEHYDE AND ACETIC ACID AND CHLORIDES IN WOOD COMPONENTS AND PLASTICS YOU'LL FIND THEM FROM INTERIOR POLUTEANTS.

NEXT.

THE EXTERNAL COMPONENTS ARE BURNING OF FOSSIL FUELS IN THE INDUSTRIAL PARTS OF THE WORLD. THE PICTURE IS A PICTURE OF SMOG IN BEIJING.

THAT'S A GOOD EXAMPLE OF A HIGHLY INDUSTRIAL AREA.

NEXT.

AS I MENTIONED, FORMALDEHYDE AND ASCETIC ACID AND IT'S FROM INAPPROPRIATE BUILDING AND STORAGE MATERIALS, CERTAIN TYPESED WOODS AND ELECTROSTATIC PRECIPITATORS WHICH WERE A WAY OF FILTERING THINGS OUT IN OLDER SYSTEMS AND PRODUCE OZONE AND CHLORIDES FROM POOR HOUSING MATERIALS, ESPECIALLY POOR QUALITY PLASTICS.

SO POLLUTANTS ARE USUALLY MEASURED IN MICROGRAMS.

THERE ARE DIFFERENT WAYS TO MEASURE THEM.

THERE'S TEXTILE AND CORROSION
COUPONS LIKE THE IMAGE I'M
SHOWING THERE.

THERE'S A PARTICULARLY
ANALYTICAL WAY AND YOU PUT THE
BOX IN THE ROOM.

IT WILL TAKE AND MEASURE THE
AMOUNT OF GASES, POLLUTANTS IN
THE AIR AND SEND IT BACK TO A
LABORATORY AND THEY CAN GIVE YOU
RESULTS.

IT'S USUALLY QUITE EXPENSIVE.
IT YOU WANT TO DO IT ON THE
CHEAP, CUT PIECES OF SILVER AND
COPPER -- I DON'T RECOMMEND
CUTTING LEAD BUT SET THEM OUT
AND KEEP THEM ON YOUR DESK AND
SEE IF YOU HAVE CORROSION
PRODUCTS.

IF SILVER STARTS TO TARNISH YOU
HAVE SULFUR AND IF COPPER TURNS
GREEN YOU HAVE CHLORIDE
PROBLEMS.

IT'S A QUICK AND DIRTY WAY OF
CHECKING TO SEE IF YOU HAVE
POLLUTANT PROBLEMS.

THIS IS A SLIDE TO GIVE YOU
IDEAS OF STANDARDS FOR POLLUTANT
LEVELS AND SINCE YOU'LL GET A
COPY AFTERWARDS I'LL LET YOU
PERUSE THAT.

YOU HAVE TO LET IN SOME OUTSIDE
AIR WITH AIR-HANDLING SYSTEMS.
I THINK THE STANDARD IS 20% BUT
GOOD FILTERATION IS IMPORTANT TO
KEEP THE OUTSIDE AIR AS CLEAN AS
POSSIBLE.

YOU CAN ALSO DO INTERNAL
FILTERATION.

WATER SPAY IS ONE AND ACTIVATED
CARBON IS PROBABLY THE EASIEST
BECAUSE IT'S JUST A DRY FILTER
YOU STICK INTO YOUR SYSTEM.

NOW A DAYS MOST HAVE
DRY-SCRUBBING FILTERING.

YOU CAN HAVE YOUR SYSTEM
SELF-CONTAINED FOR SINGLE ROOM

USE LIKE THE ONE I'M SHOWING
HERE OR ONE THAT CAN BE PUT ONTO
YOUR SYSTEM.

IF YOU'RE IN A ROOM OF SILVER
AND IN A HIGH INDUSTRIAL AREA
YOU MAY WANT TO INVEST SO THINGS
DON'T TARNISH QUICKLY.

A COMPANY CALLED FROZEN
INTERCEPT MAKES THIS TINY
SYSTEM.

YOU CAN PUT THIS DEVICE INSIDE A
SMALL AREA AND IT WILL FILTER
OUT GASEOUS POLLUTANTS.

SO DAMAGE FROM POLLUTANT.

SO WHEN WE PUT UP THE MISS
LIBERTY, SHE'S MADE OF COPPER
AND USED TO LOOK LIKE COPPER AND
THANKS TO THE POLLUTION SHE HAS
ENDURED OVER THE YEARS SHE'S NOW
A NICE SHADE OF GREEN AND TURNED
FROM COPPER TO COPPER SULFATE
THANKS TO OXIDATION AND ACID
RAIN AND WHAT POLLUTANTS CAN DO
IS ERODE PIECES OF CALCIUM BASED
PLASTER AND THIS SORT OF THING
AND SHE'S LOST THE DETAIL IN HER
FACE AND DRESS.

THAT'S COMMON IN INDUSTRIAL
AREAS.

NEXT.

SO DAMAGE FROM POLLUTANTS THIS
IS RED-ROTTED LEATHER.

THERE CAN BE DAMAGE TO PAPER AND
PHOTOGRAPHS AND IT CAUSES RED
ROT IN VEGETABLE-TANNED LEATHER
MOSTLY DUE TO POLLUTANTS IN THE
AIR.

RELATIVE HUMIDITY SPEEDS UP THE
REACTION.

IT'S MOSTLY DUE TO POLLUTANTS.

OKAY, NEXT.

THAT SHOULD BE THE END.

>> IT IS THE END.

THEY WANT TO KNOW HOW YOU GET
RID OF POLLUTANTS.

IF YOU'RE REALLY MAKING AN
EFFORT TO CONTROL TEMPERATURE

AND HUMIDITY AND CLOSELY SEAL
THINGS UP DO YOU HAVE ADVICE
THERE?

INTERNAL POLLUTANT IT'S YOU'RE
BEING CONSCIENTIOUS ABOUT
KEEPING EXTERNAL RELATIVE
HUMIDITY FLUCTUATIONS FROM
CHANGE YOURS SPACE.

SHE WAS WORRIED ABOUT POLLUTANTS
TRAPPED INSIDE.

>> THESE ARE USUALLY WE'RE MORE
WORRIED ABOUT IT WHEN WE'RE
TALKING ABOUT NEW PRODUCTS.
IF YOU'VE JUST INSTALLED CARPET,
FOR EXAMPLE, THAT'S AN INTERNAL
POLLUTANTS NOT THINGS IN A SPACE
A LONG TIME.

NEW BUILDING MATERIALS ARE OUR
BIGGEST CONCERNS.

IF YOU'RE SEALING THINGS UP
THAT'S MORE IMPORTANT TO KEEP
THE OUTSIDE STUFF OUT ESPECIALLY
DUST.

THAT'S A REAL PROBLEM WITH
COLLECTIONS.

>> AND THEN SOMEONE HAS AIR
POLLUTANTS WHEN AIR'S BLOWING IN
THROUGH THE WINDOWS AND DOORS.
I GUESS THAT'S THE SAME THING
SEALING WOULD BE HELPING.

>> GASKETING, THAT SORT OF
THING, YEAH.

>> AND WITH THE SILVER AND
COPPER COUPONS, HOW LONG WOULD
YOU LEAVE THOSE OUT?

>> YOU CAN LEAVE THEM OUT I'M
TRYING TO REMEMBER HOW LONG THEY
LEFT THEM OUT WHEN THEY DID THE
TESTING HERE.

A COUPLE WEEKS.

IT DOESN'T HAVE TO BE VERY LONG.
MAYBE A MONTH TOPS.

>> AND I KNOW WE WENT THROUGH
THIS QUICKLY ESPECIALLY AT THE
END BUT PEOPLE HAVE A SCHEDULE.
I DID SHARE YOUR E-MAIL ADDRESS
IN CASE THERE'S QUESTIONS THAT

NEED TO BE ANSWERED.
WE CAN PUT THOSE UP.
IF YOU ATTENDED WITH A COLLEAGUE
OR FRIEND LET US KNOW IN THE
CHAT BOX I JUST DRAGGED IN THE
SCREEN.

WE WANT TO MAKE SURE IF YOU'VE
ATTENDED BY YOURSELF, DON'T
WORRY BECAUSE WE SAW YOUR LOG
IN.

IF YOU'RE WITH SOMEBODY AND WANT
TO MAKE SURE THEY GET CREDIT FOR
ATTENDANCE TELL US WHO THE OTHER
PERSON WAS.

HOW WOULD YOU DETERMINE THE
AMOUNT OF SILICA GEL TO USE?

>> I THINK I GAVE -- I THINK IT
WAS 20 MILLIGRAMS PER CUBIC
METER FOR ONE YEAR IS A GOOD
RULE OF THUMB.

>> THERE'S A CALCULATOR ONLINE
WE'LL GET THE LINK UP FOR TOO.
A COUPLE QUESTIONS CAME IN.
WANT TO LET THE AUDIENCE KNOW
CAME IN ABOUT STORAGE MATERIALS
AND SHE'S GOING ANSWER THEM NEXT
WEEK.

SO A LOT OF THESE ISSUES WITH
POLLUTION IT CAN BE COMBATED
WITH GOOD STORAGE SO A LOT OF
THOSE COMING TO YOU NEXT
TUESDAY.

ARE YOU ABLE TO ANSWER THIS
QUESTION ABOUT SILVER MIRRORING
PROBLEMS AND THERE'S A COURSE IN
MAY FROM ONE OF THE BEST PHOTO
PRESERVATION EXPERTS IN THE U.S.
I KNOW IT WILL BE ADDRESSED
FULLY BUT JUST TO KEEP PEOPLE --
GIVE THEM AN ANSWER BEFORE MAY

--

>> IT REQUIRES A PHOTO EXPERT TO
CHANGE THE COMPOSITION.
I THINK IT'S A REDUCING
SOLUTION.

IT'S COMPLICATED.

IT'S CHEMISTRY.

WE'RE JUST AT 3:30 BUT DID YOU SEE ANY OTHER QUESTIONS ABOUT LIGHT?

>> IT'S CUT OFF ON MY SCREEN. I CAN ONLY SEE PART OF IT.

>> IS THAT BETTER?

>> THANK YOU.

WHY DOES REFLECTING LIGHT PRODUCE DAMAGE?

WHAT HAPPENS WHEN YOU REFLECT LIGHT THE SURFACE IT REFLECTS ON IS ABSORBING THE ENERGY COMING FROM THE LIGHT SOURCE SO THE REFLECTING LIGHT IS LESS ENERGY. IF YOU'RE REFLECTING OFF SOMETHING THAT'S A DARKER COLOR LIKE BLACK IT'S GOING REDUCE THE ENERGY REFLECTED OFF. SO IT'S LIGHT PHYSICS.

SO UV DOESN'T NECESSARY REFLECT MORE OR LESS.

IT'S THE SAME THING.

IT CAN BE ABSORBED INTO THE SURFACE IT'S BEING REFLECTED OFF OF.

AND WOULD THERE BE BENEFIT TO STAGGER THE CYCLE OF STAGGERING THE BULB SINCE THEY HAVE A FINITE LIFE SPAN.

NOT SURE I KNOW THE ANSWER TO THAT QUESTION.

BUT THE FORMULA INTENSITY TIMES TIME WHEN IS DAMAGE OCCURRING. THERE'S A LINK TO THE CANADIAN CONSERVATION INSTITUTE WHICH IS THE LIGHT DAMAGE RULER AND CAN SEE COLORANTS DAMAGED OVER TIME AND YOU CAN PUT IT WHETHER IT'S DAYLIGHT EXPOSURE AND YOU CAN SEE IT IN REAL-TIME OR IN ACTION.

I CAN'T --

>> I JUST WONDERED IF IN TERMS OF COST EFFECTIVENESS -- SOME OF THESE NEWER LIGHT BULBS ARE SO EXPENSIVE I'M NOT SURE IF I UNDERSTAND IT EITHER.

YES, NICOLE, IF YOU CAN SEND US AN E-MAIL WITH MORE INFORMATION OR PUT IT INTO THE CHAT NOW WE CAN FIND YOU AN ANSWER.

SO THERE'S SOME REALLY GREAT CONSERVATION HAPPENING IN THE CHAT AND FOLKS ARE WELCOME TO STICK AROUND AND KEEP THOSE GOING FOR A FEW MINUTES.

I'M HAPPY TO DO THAT BUT I KNOW OTHERS HAVE TO GET ON TO THE REST OF THEIR DAY AND I WANT TO THANK EVERYBODY FOR ATTENDING AND THANK TARA FOR HER HELP AND COME BACK AND TALK ABOUT MOLD WHICH IS GOING TO BE VERY IMPORTANT AND INTERESTING AND THAT'S NEXT THURSDAY I BELIEVE.

>> YES.

>> SO WE WILL SEE YOU THEN AND THANK YOU FOR YOUR HELP AND THANKS FOR EVERYONE WHO CAME AND JOINED US TODAY.

STICK AROUND AND CHAT AND DEFINITELY KEEP AN EYE ON THE WEB PAGE FOR THE LINKS WE TALKED ABOUT TODAY.

>> THANK YOU VERY MUCH.

>> THANK YOU.

.