

Lighting section

>>> HI, I'M RON JARNIGIN FROM PACIFIC NORTHWEST NATIONAL LABORATORY AND I'M  
AST CHAIR OF THE ASHRAE PROJECT COMMITTEE. I'D LIKE TO WELCOME YOU TO OUR  
BROADCAST ON ASHRAE STANDARD 90.1, 1999 AND THIS BROADCAST IS TITLED  
STANDARD 90.1 IN MORE DEPTH. THIS IS IN RESPONSE TO THE FEEDBACK WE HAD  
FROM YOU LAST YEAR FROM OUR SATELLITE BROADCAST, WHERE YOU ASKED FOR  
MORE DETAIL ON THE STANDARD. HOPEFULLY, WE'LL BE ABLE TO PROVIDE THAT TO  
YOU IN THIS SEGMENT. I'D LIKE TO WELCOME OUR NATIONAL AUDIENCE. WE HAVE  
OVER 160 SITES SIGNED UP OUT THERE. GLAD TO HAVE YOU WITH US, AS WELL AS  
OUR STUDIO AUDIENCE, WHICH IS BEING PROVIDED BY THE INLAND EMPIRE CHAPTER  
OF ASHRAE HERE IN SPOKANE, ALONG WITH SOME OF THEIR INVITED GUESTS. WE  
REALLY APPRECIATE YOU GUYS COMING IN TODAY. I'D LIKE TO WELCOME OUR  
PRESENTERS, AND I'LL BE INTRODUCING THE ONE FOR THIS SEGMENT IN A MOMENT  
AND ALSO I'D LIKE TO THANK OUR SPONSORS, THE DEPARTMENT OF ENERGY,  
ASHRAE, AND THE ILLUMINATING ENGINEER SOCIETY OF NORTH AMERICA. THE  
FORMAT IS THREE SEGMENTS, ONE, DEDICATED TO ENVELOPE, ONE TO MECHANICAL,  
AND ONE TO LIGHTING. THE TWO PREVIOUS SEGMENTS, ENVELOPE AND  
MECHANICAL, WE'VE ALREADY COMPLETED AND WE'RE NOW MOVING INTO THE  
LIGHTING. THERE WILL BE AN OPPORTUNITY FOR QUESTIONS AND ANSWERS AT THE  
END OF THIS SEGMENT AND PART OF THE WAY THROUGH THE BROADCAST AND NEAR  
THE END. YOU'LL SEE NUMBERS ON YOUR SCREEN FOR CALL-IN AND FAX-IN  
QUESTIONS. WE'LL TRY TO GET TO AS MANY OF THOSE AS WE CAN IN THE TIME  
ALLOTTED WHILE WE'RE TALKING ABOUT THE 90.1, '99 STANDARD IN THE  
PRESENTATION TODAY, I WANT YOU TO REALIZE THAT ASHRAE HAS JUST RELEASED,  
AND LITERALLY, HOT OFF THE PRESS HERE, THE 2001 VERSION OF THE STANDARD,  
WHICH INCLUDES ALL OF THE APPROVED ADDENDA THAT HAVE BEEN PROCESSED  
UNDER CONTINUOUS MAINTENANCE. I BELIEVE OUR PRESENTER WILL BE  
REFERENCING SOME OF THESE IN HIS PRESENTATION. YOU ARE PROBABLY GOING  
TO WANT TO KNOW WHERE TO GET THAT STANDARD AND ON YOUR SCREEN, YOU  
SHOULD SEE THE INFORMATION ABOUT THE AVAILABILITY OF THE STANDARD. YOU  
CAN PURCHASE THAT AT THE ASHRAE BOOKSTORE THROUGH THE WEBSITE, OR  
THEIR CALL-IN NUMBER, WHERE YOU CAN CALL THE SOCIETY AND ORDER YOUR NEW  
VERSION OF THE STANDARD. AND BELIEVE ME, THIS IS HOT OFF THE PRESS. IT  
ARRIVED HERE A COUPLE HOURS AGO. SO, YOU WANT TO HURRY UP AND GET YOUR  
COPIES BEFORE THE FIRST PRINTING RUNS OUT. I MIGHT ALSO MENTION ONE OF THE  
THINGS THAT'S IMPORTANT ABOUT THIS STANDARD IS, WHERE STATES ARE IN THEIR  
ADOPTION PROCESS. WE FREQUENTLY GET QUESTIONS ABOUT THE STANDARD  
BEING IMPLEMENTED OR ADOPTED BY STATES. YOU SEE ON THE SCREEN A MAP OF  
THE UNITED STATES, WITH COLOR CODING. THE LEGEND MAY BE A BIT DIFFICULT TO  
READ, BUT THE PURPLE STATES ARE STATES THAT MEET OR EXCEED THE '89  
VERSION, THE PREVIOUS VERSION. THE RED STATES ARE THOSE THAT MEET OR  
EXCEED THE '99 VERSION AND THOSE INDICATED IN YELLOW ARE THE STATES THAT  
ARE CURRENTLY IN THE PROCESS OF ADOPTING. MANY OF THE STATES THAT HAVE  
ONLY THE '89 VERSION REALIZE THAT THE '99 VERSION ACTUALLY CAME OUT AND  
WAS PHYSICALLY AVAILABLE IN EARLY 2000. SO, THEY MAY BE WORKING IN THAT  
DIRECTION, ALSO. AND I WANT TO ENCOURAGE ALL OF THOSE STATES TO MOVE  
FORWARD, AS WELL AS THOSE STATES SHOWN IN WHITE, WHO WE DON'T HAVE  
INFORMATION ON YET AS TO THEIR STATUS. NOW, I'D LIKE TO MOVE TO THE  
PRESENTER FOR THIS SEGMENT AND WITH US THIS AFTERNOON IS JOE HALLY FROM  
GE LIGHTING. JOE SERVED AS A MEMBER OF THE PROJECT COMMITTEE AND CHAIRED  
THE LIGHTING SUBCOMMITTEE, SO HE'S CERTAINLY AN EXPERT IN THE LIGHTING, AND  
HE'S GOING TO TELL YOU ABOUT THE LIGHTING REQUIREMENTS AND STANDARD 90.1.  
YES? >> THANKS, RON. I'D LIKE TO WELCOME EVERYBODY TO THE LIGHTING  
PORTION OF THE PROGRAM, ESPECIALLY THOSE MEMBERS JOINING US FOR THE  
FIRST TIME TODAY. LIGHTING IS IMPORTANT BECAUSE IT IS SIGNIFICANTLY PART OF  
BUILDING ENERGY USE. LIGHTING CAN BE 30% TO 40% OF THE ENERGY USE IN A

COMMERCIAL BUILDING SUCH AS A STORE, HOSPITAL OR OFFICE BUILDING. IN ADDITION, THERE HAVE BEEN TREMENDOUS ADVANCEMENTS IN LIGHTING TECHNOLOGY OVER THE PAST 10 TO 15 YEARS. THESE NEW TECHNOLOGIES HAVE ALLOWED THE STRINGENCY OF THE 90.1, 1999 STANDARD, TO INCREASE VERSUS THE 1989 STANDARD. THEREFORE, FROM AN ENERGY SAVING STANDPOINT, LIGHTING IS A VERY IMPORTANT PART OF 90.1, 1999 STANDARD WHICH I WILL NOW BEGIN TO REVIEW. IN THE LIGHTING SECTION, WHICH IS SECTION 9 IN THE STANDARD, I'M GOING TO COVER FOUR GENERAL AREAS TODAY. THE FIRST BEING A COMPARISON BETWEEN THE '89 AND THE '99 STANDARD. AND I THINK YOU'LL FIND THERE'S SIGNIFICANT DIFFERENCES BETWEEN THESE TWO STANDARDS IN THE LIGHTING SECTION. SECOND, A REVIEW OF HOW THIS APPLIES TO EXISTING BUILDINGS. THIRD, AND THE MOST SIGNIFICANT PART OF THE REVIEW TODAY, IS AN OVERVIEW OF THE '99 STANDARD. IN THIS, WE'LL COVER THE INTERIOR LIGHTING REQUIREMENTS, BOTH FROM A WHOLE BUILDING AND A SPACE-BY-SPACE METHOD. AND ALSO THE EXTERIOR LIGHTING REQUIREMENTS. AND FINALLY, WE'LL FINISH IN TALKING ABOUT SOME OF THE MORE SIGNIFICANT ADDENDA. AS YOU KNOW, THE STANDARD IS NOW UNDER, OR AS YOU MAY KNOW, THE STANDARD IS UNDER CONTINUOUS MAINTENANCE WITH ADDENDA BEING CONSIDERED EACH YEAR. FIRST, A COMPARISON OF 1989 VERSUS 1999. IN GENERAL, YOU SHOULD FIND THE '99 STANDARD TO BE MUCH EASIER TO USE. IT'S A MUCH MORE SIMPLIFIED APPROACH. THE LANGUAGE IS MUCH MORE DIRECT. IT'S WRITTEN IN A CODE ENFORCEABLE LANGUAGE. MUCH MORE SPECIFIC REQUIREMENTS, RATHER THAN A LOT OF ENGINEERING CONSIDERATIONS THAT APPEARED IN THE '89 STANDARD. WE'LL GO THROUGH SOME OF THESE SPECIFIC CHANGES WHICH MAKE THE STANDARD EASIER TO USE. FIRST OF ALL, THE LIGHTING CONTROL CREDITS WERE ELIMINATED. IN THE '89 STANDARD, THERE'S A WHOLE TABLE OF CONTROL CREDITS WHEREBY PUTTING VARIOUS DIFFERENT CONTROLS, OCCUPANCY SENSORS OR DAYLIGHT CONTROLS, YOU GOT VARIOUS CREDITS THAT YOU COULD APPLY TO THE WATTS PER SQUARE FOOT NUMBER. THESE HAVE BEEN ELIMINATED, BUT THEY'VE BEEN REPLACED WITH MANDATORY CONTROL REQUIREMENTS WHICH APPLY IN CERTAIN SITUATIONS FOR CERTAIN BUILDING TYPES. I'LL GO INTO THOSE LATER IN THE PRESENTATION. SECONDLY, CONTROL POINTS FOR SPACES ARE NO LONGER USED. WE HAD A LOT OF COMMENTS THAT THIS WAS A FAIRLY CONFUSING ASPECT OF THE '89 STANDARD TO TRY TO ESTIMATE OR CALCULATE A VARIETY OF DIFFERENT CONTROL POINTS. SPACES NO LONGER REQUIRE A MINIMUM NUMBER OF CONTROL POINTS, ALTHOUGH THERE ARE MAXIMUM SQUARE FOOTAGE REQUIREMENTS IN TERMS OF YOUR CONTROL. THIRD, THE BUILDING AREA ALLOWANCES NO LONGER DEPEND ON THE SIZE OF THE BUILDING. AGAIN, IN THE '89 STANDARD, THERE WERE DIFFERENT WATTS PER SQUARE FOOT NUMBERS, DEPENDING ON THE OVERALL SIZE OF THE BUILDING. IN THE '99 STANDARD, THERE'S A MUCH MORE COMPLEX MODELING PRODUCER USED THAT TAKES INTO ACCOUNT THE SPACE REQUIREMENTS AND, THEREFORE, THERE'S JUST ONE NUMBER NOW FOR VARIOUS SPACES AND FOR VARIOUS BUILDINGS, NOT DIFFERENT NUMBERS FOR DIFFERENT-SIZE BUILDINGS. AND FOURTH, ON THE SLIDE IS THE AREA FACTOR NO LONGER NEEDS TO BE CALCULATED. THIS WAS A FACTOR IN THE '89 STANDARD WHERE YOU HAD TO CONSIDER THE LENGTH, WIDTH, AND HEIGHT OF VARIOUS ROOM SPACES, CALCULATING A ROOM CAVITY RATIO. AND YOU HAD TO PUT THIS INTO THE NUMBER, AS WELL. YOU HAD AN AREA FACTOR WHICH YOU CALCULATED DEPENDING ON THE HEIGHT OF THE CEILING AND THE CONFIGURATION OF THE SPACE, WHICH, OF COURSE, AFFECTS THE EFFICIENCY OF THE OVERALL LIGHTING SYSTEM. THIS IS BUILT INTO MODELING SYSTEM USED IN THE '99 STANDARD AND IT NO LONGER HAS TO BE CALCULATED. A COUPLE OF OTHER CHANGES ARE IN THE EXTERIOR LIGHTING POWER AREA. THESE HAVE BEEN SIMPLIFIED AND TODAY, FOR MOST OF THE GROUND SITTING, THERE IS A MINIMUM EFFICACY REQUIREMENT, A LUMENS PER WATT SOURCE FOR OUTDOOR LIGHTING FIXTURES. IN ADDITION, GIVEN THE NEW TECHNOLOGIES THAT WERE CONSIDERED IN THE '99 VERSION, WE CAME OUT WITH MORE STRINGENT LIGHTING POWER REQUIREMENTS. AND THESE ARE

BASED ON REAL LIGHTING MODELS, WHICH ALSO WE'LL DISCUSS LATER ON. THE NEXT, FOR THE NEXT PART, I'D LIKE TO TALK ABOUT HOW LIGHTING ALTERATIONS APPLY TO EXISTING BUILDINGS. PERHAPS MORE THAN ANY OTHER PART OF THE STANDARD, LIGHTING IS CHANGED MORE FREQUENTLY. CERTAINLY MORE FREQUENTLY THAN ENVELOPE OR HVAC WITHIN THE BUILDING. FOR SOME BUILDINGS, LIKE STORES, LIGHTING CHANGES COULD BE QUITE FREQUENT. AND THE QUESTION WOULD BE, HOW WOULD THE STANDARD APPLY TO THESE LIGHTING CHANGES? THE MAIN PART TO REMEMBER HERE IS IF YOU^-- THE LIGHTING ONLY APPLIES IF YOU ARE REPLACING MORE THAN 50% OF THE LIGHTING WITHIN A SPACE. SO, IF YOU'RE JUST DOING SOME MINOR ALTERATIONS OR FIXING OR CHANGING A FEW FIXTURES, THE STANDARD WOULD NOT APPLY TO AN EXISTING BUILDING. HOWEVER, IF YOU DO A CHANGE OUT OF THE COMPLETE LIGHTING SYSTEM, THE CEILING OR VAST MAJORITY OF IT, YOU WOULD HAVE TO COMPLY WITH THE LIGHTING POWER DENSITY REQUIREMENTS FOR THAT SPACE. YOU WOULD NOT HAVE TO COMPLY WITH AUTOMATIC CONTROL SHUT-OFF REQUIREMENTS, BUT ANY NEW CONTROL DEVICES AS DIRECT REPLACEMENTS OF EXISTING CONTROL DEVICES WOULD HAVE TO MEET THE MAXIMUM SQUARE FOOTAGE REQUIREMENTS FOR INDIVIDUAL CONTROLS. NOW, I'D LIKE TO GET INTO THE BULK OF THE STANDARD FOR LIGHTING SECTION. AND AS THIS PICTURE SHOWS, YOU CAN SEE THERE COULD BE QUITE A BIT OF ENERGY USED FOR LIGHTING. THERE'S A NIGHTTIME SHOT. LIGHTING, YOU MIGHT SAY, IS VISIBLE ENERGY. AND IT'S ONE POWER YOU CAN ACTUALLY SEE BEING USED. IN THE LIGHTING SECTION, THERE ARE THREE MAIN AREAS. GENERAL APPLICATION, MANDATORY PROVISIONS AND THE PRESCRIPTIVE PATH. THE GENERAL APPLICATION SECTION COVERS THE INTERIOR SPACES OF BUILDINGS, EXTERIOR BUILDING FEATURES. EXTERIOR GROUNDS LIGHTING, IF IT IS POWERED THROUGH THE BUILDING POWER SYSTEM, THERE ARE SEVERAL EXCEPTIONS. THERE'S EXEMPTIONS FOR EMERGENCY LIGHTING, FOR LIGHTING REQUIRED BY LIFE SAFETY STATUTE, FOR LIGHTING WITHIN THE DWELLING, LIGHTING BETWEEN LIVING UNITS OF BUILDINGS, SUCH AS INDIVIDUAL APARTMENTS IN AN APARTMENT BUILDING. AND FINALLY, DECORATIVE GAS LIGHTING IS EXEMPT. FIRST, THERE ARE MANDATORY PROVISIONS. THE FIRST MANDATORY PROVISION DEALS WITH SPACE CONTROL AND, SPECIFICALLY, THE NUMBER OF CONTROL DEVICES REQUIRED FOR A BUILDING. A SINGLE CONTROL DEVICE CANNOT CONTROL MORE THAN 2,500 SQUARE FEET IF THE SPACE IS LESS THAN 10,000 SQUARE FEET. IF THE SPACE IS MORE THAN 10,000 SQUARE FEET, THERE HAS TO BE A CONTROL DEVICE FOR EACH 10,000 SQUARE FEET OF LIGHTING. THIS IS TO ADD SOME FLEXIBILITY FOR THE SPACE USE, TO MAKE SURE THAT THE WHOLE SPACE DOES NOT HAVE TO BE TURNED ON IF, INDEED, ONLY A CERTAIN PART OF THE BUILDING ARE BEING OCCUPIED AND USED. THE CONTROL MUST BE ACCESSIBLE AND LOCATED SO OCCUPANTS CAN SEE THE SWITCH AND CONTROL THE SWITCH. THERE ARE EXCEPTIONS, SUCH AS WHEN REQUIRED FOR SAFETY AND SECURITY. IF, IN A PUBLIC BUILDING LOBBY OR A BANK BUILDING, YOU WOULD NOT WANT PEOPLE TO BE ABLE TO TURN OFF THE LIGHTS. AND SO FOR SAFETY OR SECURITY REASONS, THAT LIGHTING DOES NOT HAVE TO BE READILY ACCESSIBLE TO THE OCCUPANTS OF THE BUILDING. AND FINALLY, AT LEAST ONE CONTROL DEVICE FOR EACH ROOM OR SPACE ENCLOSED BY CEILING HEIGHT PARTITIONS MUST BE MADE AVAILABLE. PROBABLY ONE OF THE MOST SIGNIFICANT PARTS OF THE STANDARD IS THE REQUIREMENT FOR AUTOMATIC LIGHTING SHUT-OFF. ESSENTIALLY, THIS REQUIREMENT IS A REQUIREMENT WHERE WE HAVE TO MAKE SURE THAT THE LIGHTS ARE SHUT OFF WHEN THE BUILDING BECOMES UNOCCUPIED OR THE SPACE BECOMES UNOCCUPIED. THE APPLIES TO BUILDINGS GREATER THAN 5,000 SQUARE FEET. THE TWO CHOICES ARE TO EITHER PUT IN A TIME SCHEDULING DEVICE, SUCH AS A WHOLE BUILDING LIGHTING CONTROLLER, OR TO PUT IN OCCUPANCY SENSING DEVICES IN INDIVIDUAL SPACES OR ROOMS. THE WHOLE BUILDING APPROACH OR THE PROGRAMMABLE LIGHTING APPROACH TYPICALLY WOULD BE USED WHEN THERE'S KNOWN OR SET OCCUPANCY. THIS WOULD BE WHERE YOU KNOW THAT EVERYBODY COMES INTO THE SPACE, LET'S SAY,

8:00 OR 9:00 IN THE MORNING, AND THEN THE SPACE IS, PEOPLE LEAVE AT THE END OF THE DAY, SAY, AT 5:00. AND IN THIS CASE, YOU CAN PROGRAM IN A TIMING OF WHEN THE LIGHTS ARE TO COME ON AND TO COME OFF. IT WORKS WELL IN RETAIL SPACES, AS WELL. WHERE YOU HAVE THINGS SUCH AS SMALL OFFICES OR CONFERENCE ROOMS, OR EVEN REST ROOMS WHERE THE OCCUPANCY IS NOT KNOWN, YOU DON'T KNOW WHEN IT'S GOING TO BE USED OR NOT USED, OCCUPANCY SENSORS TEND TO WORK BETTER. THERE ARE MANY VARIETIES OF OCCUPANCY SENSORS IN USE TODAY. THIS TECHNOLOGY HAS BEEN FAIRLY PROVEN, BOTH INFRARED AND ULTRASONIC DEVICES ARE AVAILABLE, EITHER CEILING OR WALL-MOUNTED DEVICES. FOR EXTERIOR LIGHTING, YOU ALSO HAVE TO MAKE SURE THAT THE LIGHTS ARE TURNED OFF WHEN THERE'S SUFFICIENT DAYLIGHT AVAILABLE. IN MOST CASES, THIS WOULD BE ACCOMPLISHED THROUGH PHOTO CELLS OR, IN SOME CASES, ASTRONOMICAL TIME SWITCH REQUIREMENTS. IN TERMS OF THE TIME SWITCH REQUIREMENTS, THOSE WOULD HAVE TO BE SEVEN-DAY ELECTRICALLY DRIVEN MECHANICAL CLOCKS, THE TRIPPERS, DIAL, STORAGE, OR SEVEN-DAY OR CALENDAR YEAR PROGRAMMABLE TIME SWITCHES WITH ASTRONOMIC BATTERY BACKUP. IN MOST CASES, PEOPLE WILL USE THE PHOTO CELL VERSUS THE MORE COMPLICATED SWITCH CONTROLLERS TO TRACK BASICALLY THE TIME OF THE YEAR AND TO TRACK WHEN THERE'S DAYLIGHT AND WHEN THERE'S NOT DAYLIGHT. THERE ARE SOME EXEMPTIONS TO THIS REQUIREMENT. FOR INSTANCE, COVERED VEHICLE ENTRANCES ARE EXEMPTED FROM THE REQUIREMENT. ALSO, EXITS FROM BUILDINGS OR PARKING STRUCTURES, WHERE REQUIRED FOR SAFETY, SECURITY OR EYE ADAPTATION. IN MANY CASES, IF YOU'RE DRIVING IN FROM THE BRIGHT SUNLIGHT OUTDOORS, YOU WANT TO HAVE SOME LIGHTING IMMEDIATELY IN THE ENTRANCE TO THAT GARAGE, EVEN THOUGH IT'S DAYLIGHT, SIMPLY TO ADAPT THE EYE DOWN FROM THE BRIGHT DAYLIGHT DOWN INTO THE LOW LEVELS FOUND WITHIN THE PARKING GARAGE. AND THERE ARE ADDITIONAL OR SEPARATE CONTROL REQUIREMENTS FOR MANY SPECIAL APPLICATIONS. HERE, YOU SEE SOME OF THESE REQUIREMENTS FOR THINGS SUCH AS DISPLAY AND ACCENT LIGHTING, CASE LIGHTING, HOTEL, MOTEL GUEST ROOM LIGHTING, TASK LIGHTING, NON-VISUAL LIGHTING AND DEMONSTRATION LIGHTING. FOR THE DISPLAY AND ACCENT LIGHTING, AND CASE LIGHTING, THE IDEA IS THESE SHOULD BE CONTROLLED SEPARATELY, SO THAT, FOR INSTANCE, IN A RETAIL STORE, YOU WOULD NOT HAVE TO TURN ON ALL THE ACCENT LIGHTING, IN THE CASE LIGHTING, BEFORE IT WAS REQUIRED. WHICH IS, BEFORE THE CUSTOMERS ENTER THE STORE. SO YOU CAN GIVE THE WORKERS AN HOUR OR SO EARLIER, ONLY PUT ON THE GENERAL LIGHTING, AND THEN HAVE THE CASE AND ACCENT LIGHTING SEPARATELY SWITCHED. IN THE CASE OF THE HOTEL AND MOTEL GUEST ROOM LIGHTING, IT'S ALSO AN INTERESTING REQUIREMENT. THIS IS A REQUIREMENT THAT WOULD REQUIRE YOU TO PLACE ONE SWITCH IN THE ROOM AT THE EXIT TO THE ROOM, WHEREBY WHEN YOU COULD HIT THE SWITCH, AND IT COULD CYCLE THROUGH ALL THE SWITCHED PLUG LOADS, OR THE PERMANENT LIGHTING FIXTURES BETWEEN SPACE AND TURN THEM OFF. THE IDEA ALSO WOULD BE AS YOU ENTERED THE HOTEL ROOM, WHEN YOU HIT THAT SWITCH ON, IT WOULDN'T TURN ALL THE LIGHTS ON, IT WOULD PERHAPS TURN THE ONE LIGHT ON NEAR THE DOOR, AND YOU COULD GO THROUGH THE HOTEL ROOM, PERHAPS, THROUGH YOUR STAY AND TURN ON OTHER LIGHTS AS NEEDED. BUT THEN WHEN YOU'RE EXITING, YOU CAN HIT THAT ONE SWITCH AND HAVE ALL THE LIGHTS TURN OFF. THIS IS BECAUSE STUDIES HAVE SHOWN THAT MOST PEOPLE WILL, WHEN THEY LEAVE A HOTEL ROOM, THEY DON'T TURN OFF MOST OF THE LIGHTS. AS YOU'RE EXITING THE ROOM, WE'VE ALL BEEN THERE, YOU LOOK AROUND THE ROOM, YOU SEE FIVE OR SIX LIGHTS ON, BUT YOU HAVE YOUR LUGGAGE, YOU'RE READY TO LEAVE, AND YOU SIMPLY DON'T BOTHER TO GO BACK IN AND TURN ALL THE LIGHTS OFF. SO THERE'S A LOT OF POWER USED THERE BETWEEN WHEN THE LIGHTS ARE TURNED OFF AND WHEN THE MAID COMES IN TO CLEAN UP THE ROOM AND ENDS UP TURNING OFF ALL THE INDIVIDUAL LIGHTS AT THAT POINT. SO, THIS IS PROBABLY THE MOST INTERESTING REQUIREMENT OF THE SPECIALTY CONTROLS. THE NEXT SECTION

WE'RE GETTING INTO, TANDEM WIRING. THE FIRST QUESTION MAY BE, WHAT IS TANDEM WIRING? THERE IS A TANDEM WIRING REQUIREMENT FOR ONE LAMP OR THREE-LAMP FIXTURES WHEN THEY'RE WITHIN TEN FEET OF EACH OTHER, AS MEASURED CENTER TO CENTER. TANDEM WIRING IS WHERE WE SHARE A BALLAST WITH TWO SEPARATE FIXTURES. WE HAVE TWO THREE-LAMP FIXTURES HERE. IN ONE OF THE FIRST FIXTURES, THERE ARE TWO BALLASTS, AND IN THE SECOND, THERE ARE ONE. THIS IS COMMON OF THE OLDER ELECTROMAGNETIC BALLASTS FOUND IN MANY BUILDINGS TODAY. IN THIS PARTICULAR CASE, ONE OF THE TWO LAMP BALLASTS IS OPERATING THE CENTER LAMP FROM THE FIRST FIXTURE AND THE SECOND FIXTURE. THE REASON FOR THIS REQUIREMENT IS THAT THEY DRAW JUST AS MUCH ENERGY AS TWO-LAMP BALLASTS IN THE OLD DESIGN. AND, THEREFORE, THIS ALLOWS US TO USE ONE LESS BALLAST AND USE SLIGHTLY LESS WATTAGE FOR THE REQUIREMENTS. THERE ARE MANY EXCEPTIONS FOR THE TANDEM WIRING. IF YOU HAVE SEPARATE SURFACE FIXTURES OR PENDANTS, THESE ARE NOT REQUIRED TO BE TANDEM WIRED. IF THEY ARE MORE THAN TEN FEET APART, TYPICALLY THE BALLASTS HAVE A HARD TIME STARTING THE LAMP IF THERE IS A LONG STARTING DISTANCE. ALSO, FIXTURES WITH THREE-LAMP BALLASTS, ON EMERGENCY LIGHTING CIRCUITS, WHERE THERE'S NO AVAILABLE PAIR, THESE ARE, THE COMMITTEE FELT, THAT IT WAS NECESSARY TO PUT ON SEPARATE EXEMPTIONS. YOU WOULD NOT HAVE ANY OTHER FIXTURE TO TANDEM WIRE IT TO. AND THEN, FINALLY, THERE'S AN EXEMPTION FOR HIGH-FREQUENCY BALLASTS. MOST ARE GOING THROUGH THE ELECTRONIC, AND THIS GIVES YOU ANOTHER INCENTIVE TO GO TO THE ELECTRONIC BY HAVING AN EXEMPTION TO THE TANDEM WIRING REQUIREMENT FOR USE OF ELECTRONIC BALLASTS. THE NEXT MANDATORY PROVISION HAD TO DO WITH EXIT SIGNS. EXIT SIGNS WHICH OPERATE OVER 20 WATTS MUST HAVE A SOURCE EFFICACY OF OVER 35 LUMENS PER WATT. GENERALLY, WHAT THIS MEANS IS THAT YOU'LL FIND THAT LED EXIT SIGNS USING LED LAMPS WILL MEET THE REQUIREMENTS, BECAUSE THEY OPERATE LESS THAN 20 WATTS. THEY WOULD NOT HAVE A GREATER THAN 35 LUMENS PER WATT, THEY WOULD MEET IT BECAUSE THEY'RE LESS THAN 30, LESS THAN 20 WATTS IN TOTAL. COMPACT FLUORESCENT LAMPS TYPICALLY WILL MEET THE STANDARD BECAUSE THEY HAVE GREATER THAN 35 LUMENS PER WATT. AND THAT'S THE SYSTEM. AND FINALLY, THE MAJORITY OF THE LESS EXPENSIVE INCANDESCENT EXIT SIGNS WOULD NOT MEET THIS REQUIREMENT. THE REASON THAT THE LED EXIT, THE REASON THAT THE CODE WAS WRITTEN THIS WAY IS LED LAMPS IN AND OF THEMSELVES TODAY ARE NOT VERY EFFICIENT, BUT THEY HAVE A VERY HIGH LUMINESCENCE. THEY'RE VERY GOOD HIGH FOR SIGNAGE, BUT THEY DON'T GENERATE A LOT OF LUMENS, SO IT WOULD BE DIFFICULT TO LIGHT A ROOM WITH LED LIGHTS. ALTHOUGH IF YOU DON'T USE MUCH POWER, YOU CAN SEE THEM FROM A LONG DISTANCE, SO THEY MAKE AN IDEAL APPLICATION FOR A TRAFFIC SIGNAL LIGHT OR ANY KIND OF SIGNAGE. NOW, I'VE USED THE TERM "EFFICACY" IN SEVERAL OF THE SLIDES, AND I'D LIKE TO JUST DESCRIBE WHAT THAT MEANS. A LOT OF PEOPLE USE THE TERM EFFICIENCY. IT'S VERY SIMILAR. BASICALLY, IN LIGHTING, WE USE EFFICACY TO DESCRIBE THE RATIO OF LIGHT OUTPUT TO WATTS INPUT. OR, LUMENS PER WATT. THE HIGHER THE EFFICACY, THE MORE EFFICIENT THE LIGHT SOURCE. FOR INSTANCE, WITH OUR INCANDESCENT SOURCES, 40 WATT GENERATES 495 LUMENS, WHICH IS AROUND 12 OR 10 LUMENS PER WATT. BUT A 40 WATT FLUORESCENT FOR THE SAME AMOUNT OF POWER, YOU GET MUCH HIGHER LUMENS. HERE, 3150 LUMENS, WHICH IS CLOSE TO 80 LUMENS PER WATT. SO, IT'S QUITE A JUMP IN EFFICACY OR EFFICIENCY. TYPICALLY, THE TERM EFFICACY IS USED WHERE YOU ARE COMPARING DISSIMILAR UNITS. SO HERE WE HAVE LUMENS PER WATT. IF YOU'RE COMPARING SIMILAR UNITS, WE USE EFFICIENCY. BUT THEY'RE DESCRIBING SIMILAR THINGS. NOW, MOVING INTO HOW YOU DETERMINE POWER. FIRST OF ALL, A QUESTION MIGHT BE, WHAT IS INCLUDED IN THE INSTALLED INTERIOR LIGHTING POWER? THIS INCLUDES ALL PERMANENT AND PORTABLE INTERIOR LIGHTING INTENDED FOR GENERAL AMBIENT AND TASK ILLUMINATION. THEREFORE, IF YOU'RE DOING A LIGHTING SPECIFICATION AND IT'S ON THE PLAN, EVEN IF IT'S FURNITURE-

MOUNTED EQUIPMENT, IF IT'S INTENDED TO SUPPLY THE GENERAL LIGHTING, THIS WOULD BE INCLUDED WITHIN THE LIGHTING POWER BUDGET. IT INCLUDES THE LAMP AND INCLUDES THE BALLAST FOR FIXTURES THAT HAVE THEM, AND PERHAPS CONTROLS THE CURRENT REGULATORS, WHERE APPLICABLE. THERE ARE EXCEPTIONS TO THIS. MOST NOTABLY, ONE OF THE EXCEPTIONS ARE FOR SYSTEMS THAT ARE DESIGNED TO OPERATE INDEPENDENTLY. IF TWO OR MORE INDEPENDENTLY OPERATED LIGHTING SYSTEMS CAN BE CONTROLLED TO PREVENT SIMULTANEOUS OPERATION, THEN THE BASE LIGHTING POWER SYSTEM WILL BE CONSIDERED THAT WITH THE HIGHEST WATTAGE. SO, FOR INSTANCE, IF YOU HAVE A MULTIPURPOSE ROOM IN A HOTEL THAT HAS AN INCANDESCENT SYSTEM, AS WELL AS FLUORESCENT, AS LONG AS THEY'RE INTERLOCKED SO ONLY ONE SYSTEM CAN BE OPERATED AT ONE TIME, THEN YOU ONLY HAVE TO CONSIDER THE WATTAGE OF THE SYSTEM USING THE HIGHEST MOUNT OF ENERGY. ANOTHER INTERESTING QUESTION IS, HOW DO YOU DETERMINE LUMINARY WATTAGE? IF YOU ASK THIS QUESTION TO A CODE COMMITTEE, YOU CAN GET INTO VERY LONG DISCUSSIONS ON THIS, WHICH IS WHAT WE HAD ON THIS PARTICULAR ISSUE. THE FINAL DISCUSSION ON THIS LED TO THE FOLLOWING FIVE DIFFERENT WAYS TO CONSIDER WATTAGE BETWEEN LIGHTING SYSTEM. FIRST IS STANDARD INCANDESCENT FIXTURES SHALL BE THE MAXIMUM LABELED WATTAGE OF THE LUMINAIRE. THEY SHALL BE THE WATTAGE OF THE LAMP AND THE BALLAST IN COMBINATION. THE THIRD ONE IS ONE OF THE MORE INTERESTING ONES. WITH LINED VOLTAGE TRACK, YOU'RE ALLOWED A MINIMUM OF 30 WATTS, OR YOU HAVE TO CONSIDER THAT YOU USE A MINIMUM OF 30 WATTS PER SQUARE FOOT. THE REASON FOR THIS REQUIREMENT IS WE DIDN'T WANT DESIGNS GOING IN THAT PERHAPS HAD MANY FEET, MANY HUNDREDS OF FEET, LET'S SAY, OF TRACK LIGHTING WITH ONLY A FEW TRACK HEADS SPECIFIED ON THE SYSTEM. WE ALL KNOW THAT, SOONER OR LATER, THAT SYSTEM WILL HAVE MORE AND MORE LIGHTING HEADS APPLIED TO IT. AND, THEREFORE, TO MINIMIZE THE USE OF A LOT OF TRACK AND THEREFORE A LOT OF POTENTIAL FOR A LOT OF LAMPS TO BE ADDED LATER, YOU HAVE TO CONSIDER THAT AT LEAST 30 WATTS PER FOOT ARE USED WHEN YOU'RE INSTALLING TRACK LIGHTING. FOR LOW VOLTAGE LIGHTING SYSTEMS, TRACK LIGHTING SYSTEMS, IT'S THE WATTAGE OF THE TRANSFORMER, WHICH IS THE MAXIMUM RATING FOR THAT SYSTEM, AND FOR ALL OTHER LIGHTING SYSTEMS, IT IS AS SPECIFIED. >> JOE, A COUPLE OF QUESTIONS RELATED TO THE POWER USE CALCULATION THAT MAYBE WILL CLARIFY FOR ME AND SOME OF THE LISTENERS. IF WE'VE GOT A 60 WATT INCANDESCENT DOWN LIGHT THAT WE'RE USING IN A SPACE, IS 60 WATTS THE POWER THAT I ACCOUNT FOR IN THE POWER CALCULATION? >> WELL, IT'S A GOOD QUESTION, RON. IT MAY OR MAY NOT BE. IT DEPENDS ON WHAT THE FIXTURE CAN TAKE, IN TERMS OF THE MAXIMUM WATTAGE RATING, IF YOU'RE TALKING ABOUT AN INCANDESCENT LAMP WITH A MEDIUM SCREW BASE. THE REASON FOR THIS REQUIREMENT IS THAT FIXTURES THAT HAVE MEDIUM SCREW BASE SOCKETS IN THEM CAN ACCOMMODATE A LOT OF DIFFERENT LAMP TYPES. AND SO THE COMMITTEE CAN ENVISION THOUGH YOU SPECIFY A 60 WATT A-LINE, IF THAT FIXTURE CAN HANDLE 150 WATT A-LINE LAMP, THE IDEA IS THAT AT SOME POINT DOWN THE LINE, THE MAINTENANCE DEPARTMENT WILL REPLACE THAT 60 WATT WITH A 75 OR 100 OR PERHAPS 150 OR WHATEVER IS AVAILABLE. AND IN A SENSE, IT'S TRYING TO DISCOURAGE A LOT OF A-LINE DOWN LIGHT BULBS IN COMMERCIAL APPLICATIONS, GIVEN THAT YOU HAVE THIS ABILITY TO GREATLY INCREASE THE WATTAGE. >> IF THE FIXTURE HAS A RATING OF 60 WATTS, IF THAT'S THE MAXIMUM RATING, WOULD YOU USE THE 60 WATTS AS THE WATTAGE FOR THAT FIXTURE? >> SO TO CLARIFY, IT'S THE WATTAGE OF THE FIXTURE THAT'S GOING TO GOVERN WHAT YOU USE IN THE CALCULATION, AS OPPOSED TO THE BULB THAT YOU MAY SPECIFY? >> RIGHT. >> HOW ABOUT, YOU TALKED A BIT ABOUT EXIT SIGNS THERE. AND HOW ABOUT THE EXIT SIGN WATTAGE? IS THAT INCLUDED IN THE LIGHTING POWER CALCULATION, ALSO? >> NO, THAT EXIT SIGN REQUIREMENT APPLIES TO THE EFFICIENCY OF THE EXIT SIGN. BUT THE EXIT SIGN IS NOT CONSIDERED AS PROVIDING ANY MEANINGFUL LIGHT TO LIGHT THE SPACE. OF COURSE, THE BUILDING

WATTAGE REQUIREMENTS THAT WE'RE TALKING ABOUT HAVE TO DO WITH THE LIGHTING NECESSARY TO PROVIDE MEANINGFUL LIGHTING WITHIN THE SPACE. SO, EXIT SIGNS ARE NOT CONSIDERED AS PART OF THE OVERALL WATTAGE WITHIN THE SPACE. >> GREAT, THANKS. >> THANKS, RON. IN ADDITION, THERE ARE SEVERAL LIGHTING POWER EXEMPTIONS BESIDE THE EXIT SIGN THAT WE'VE JUST TALKED ABOUT. LIGHTING IS USED IN PRACTICALLY EVERY APPLICATION, AND THERE'S ALL KINDS OF UNIQUE AND SPECIAL APPLICATIONS IN LIGHTING. MANY OF THESE ARE VERY HARD TO PUT BUDGETS ON. EVEN SUCH AS THE STUDIO THAT WE'RE IN RIGHT HERE TODAY. A VERY SPECIALIZED LIGHTING SYSTEM IS SET UP HERE. AND THIS WOULD BE EXEMPTED FROM THE LIGHTING POWER DENSITY REQUIREMENTS. ALSO SPECIAL MEDICAL OR DENTAL PROCEDURES. MONUMENTS, MUSEUM OR GALLERY EXHIBITS ARE EXEMPTED. PLANT GROWTH OR MAINTENANCE TYPE LIGHTING. EQUIPMENT LIGHTING OR INSTRUMENTATION INSTALLED BY THE MANUFACTURER, JUST BASICALLY LIGHTING THAT COMES WITHIN A SPECIFIC PIECE OF EQUIPMENT. REFRIGERATOR OR FREEZER CASES ARE EXEMPT. RETAIL DISPLAY WINDOWS, REGISTERED HISTORIC LANDMARKS, ADVERTISING OR DIRECTIONAL SIGNAGE, EXIT SIGNS, YOU SEE THERE LISTED. SALE OR LIGHTING EDUCATIONAL DEMONSTRATION SYSTEMS. IF YOU'RE LIGHTING A DEMONSTRATION ROOM WHERE YOU'RE SELLING LIGHTING EQUIPMENT, THIS WOULD NOT HAVE TO COMPLY. ATHLETIC PLAYING AREAS WITH PERMANENT FACILITIES FOR TV BROADCASTING IS INTERESTING. THERE'S A LOT OF GYMNASIUMS IN MANY SCHOOLS, AND MANY OF THEM JUST HAVE STANDARD LIGHTING SYSTEMS THAT WOULD NEED TO COMPLY WITH THE CODE. BUT IF THERE IS SPECIAL EQUIPMENT THERE FOR TELEVISION BROADCAST, THEY REQUIRE MUCH GREATER LIGHT LEVEL FOR THOSE APPLICATIONS, AND THESE ARE EXEMPT. CASINO GAMING AREAS, FOR OUR FRIENDS IN NEVADA AND I GUESS MANY OTHER STATES THESE DAYS. AND SPACES THAT ARE SPECIFICALLY DESIGNED FOR USE FOR THE VISUALLY IMPAIRED. OBVIOUSLY, FOR CERTAIN APPLICATIONS, YOU HAVE TO PROVIDE MUCH HIGHER LIGHT LEVELS FOR SEEING AND VISIBILITY IN THOSE CASES. NOW, I'D LIKE TO GET INTO A SPECIFIC EXAMPLE OF HOW TO CALCULATE THE LIGHTING WATTAGE OF A ROOM AS WE JUST WENT THROUGH. IT SEEMS SIMPLE WHEN YOU ASK THE QUESTION, WHAT IS THE WATTAGE? AND THIS IS A DIFFERENT KIND OF WATTAGE. THIS IS A WATTAGE FOR CODE COMPLIANCE PURPOSES, AS OPPOSED TO, SAY, THE WATTAGE YOU MIGHT CALCULATE FOR RUNNING YOUR WIRES OR YOUR POWER REQUIREMENTS, OR EVEN AS OPPOSED TO WHAT THE ACTUAL WATTAGE DRAW YOU PUT A METER ON THE SYSTEM WOULD BE. THIS IS THE WATTAGE THAT WE WOULD WANT TO CONSIDER FOR COMPLYING WITH THE CODE. SO, HERE WE HAVE A SYSTEM WHERE LET'S SAY WE HAVE 82x4 FLUORESCENT FIXTURES. EACH CONTAINS THREE FOUR-LAMPS, AND EACH LAMP IS RATED AT 32 WATTS. WE HAVE ONE THREE-LAMP ELECTRONIC BALLAST WITHIN THIS FIXTURE. AND THE BALLAST INPUT SYSTEM IS 90 WATTS. SECONDLY, THERE'S ANOTHER SYSTEM IN THE SPACE, CONSISTING OF SIX INCANDESCENT DOWN LIGHTS. THE LAMPS AS SPECIFIED OR 60 WATT A-LINES WITH A MEDIUM SCREW BASE. HOWEVER, THE MAXIMUM LABELED WATTAGE OF THAT FIXTURE IS 75 WATTS. AND THEN FINALLY, WE HAVE 16 FEET OF LINE VOLTAGE TRACK. IT'S SPECIFIED WITH FIVE TRACK HEADS. AND EACH OF THE TRACK HEADS IS SPECIFIED IN 90-WATT HALOGEN PART LAMP. THE QUESTION IS, AGAIN FOR CODE COMPLIANCE PURPOSES, WHAT IS THE WATTAGE OF THIS SYSTEM? AND I PUT DOWN HERE, PERHAPS, THE WRONG WAY, OR MAYBE A WAY THAT PEOPLE WOULD SEEM TO EASIEST WAY TO TRY TO DETERMINE WATTAGE, AND FINALLY THE RIGHT WAY FROM A CODE COMPLIANCE STANDPOINT. PERHAPS AN EXAMPLE OF THE WRONG WAY WOULD BE TO TAKE THE EIGHT FIXTURES TIMES THE THREE LAMPS TIMES THE 32 WATTS PER LAMP, AND SAY, WELL, THAT'S THE WATTAGE RATING OF THE LAMP. SEEMS TO MAKE SENSE. BUT THERE'S A FLUORESCENT LAMP WITH A BALLAST IN IT. IF YOU TAKE IT TIMES LAMPS TIMES WATTS PER LAMP, YOU'D GET 768 WATTS. THE SECOND THING THAT SEEMS LIKE IT WOULD BE OBVIOUS IS TAKE THE SIX DOWN LIGHTS TIMES THE 60 WATTS, 360 WATTS. AND THEN FINALLY, TAKE THE FIVE TRACK HEADS TIMES THE 90 WATTS PER HALOGEN POWER LAMP AND

YOU GET 450 WATTS. YOU MIGHT SAY, THIS IS EASY. THE WATTAGE IS 1,578 WATTS. IS THAT CORRECT? WELL, THE ANSWER WOULD BE NO. FROM A CODE STANDPOINT, THAT WOULDN'T BE THE WAY TO FIGURE THE WATTAGE. AND IN THIS PARTICULAR CASE, THE RIGHT WAY TO FIGURE THE WATTAGE WOULD BE TO TAKE THE EIGHT FIXTURES TIMES THE 90 BALLAST INPUT WATTS. AND, TODAY, THERE ARE MANY DIFFERENT TYPES OF ELECTRONIC BALLASTS AVAILABLE. SOME OF THEM UNDER DRIVE THE LAMP, SOME OVERDRIVE THE LAMP. THIS IS WHY IT'S CRITICAL TO DETERMINE WHAT IS THE WATTAGE INPUT OF THAT BALLAST. SECONDLY, YOU TAKE YOUR SIX DOWN LIGHTS, BUT BECAUSE YOU CHOSE TO USE A MEDIUM SCREW-BASE TYPE OF FIXTURE, YOU HAVE TO CONSIDER THE LABELED WATTAGE OF THAT FIXTURE, WHICH IN THIS CASE IS 75 WATTS. AND THEREFORE, A CODE COMPLIANCE STANDPOINT, YOU WOULD HAVE TO ASSUME IT'S 450 WATTS. AND THEN FINALLY, FOR 16 FEET OF TRACK, YOU'D MULTIPLY THIS TIMES YOUR 30 WATTS PER FOOT. AND TO DETERMINE, YOU'D HAVE TO USE 480 WATTS. NOW, IN THIS CASE, IF THERE WAS, SAY, SIX TRACK HEADS SPECIFIED, AND SIX TIMES 90 WOULD BE 540 WATTS, YOU WOULD ACTUALLY HAVE TO USE THE 540, OR YOU'D HAVE TO USE THE HIGHER OF EITHER THE MINIMUM TRACK SPECIFIED OR THE TOTAL NUMBER OF FIXTURES THAT YOU SPECIFIED IF THAT WATTAGE, IF THE ACTUAL SPECIFIED WATTAGE IS HIGHER THAN THAT 30 WATTS PER FOOT. SO, IN THIS CASE, IT'S 1650. AND THIS MAY SEEM LIKE A SMALL DIFFERENCE, BUT AS YOU GO THROUGH A BUILDING, THIS IS ONE SMALL ROOM, THIS COULD START TO ADD UP AND CREATE A DIFFERENCE. AND ALSO, PERHAPS, CAUSE A SLIGHTLY DIFFERENT DESIGN OR SLIGHTLY DIFFERENT FIXTURE SELECTION AS YOU GO THROUGH THIS. NOW, WE JUST DISCUSSED THE WATTAGE, AND NOW WE'RE GOING TO MOVE INTO WHAT THE WATTAGE LIMIT IS. OBVIOUSLY, AFTER YOU DETERMINE THE WATTAGE OF WHAT IS USED IN THE BUILDING, YOU HAVE TO DETERMINE IF YOU MEET THE CODE LIMIT. AND THERE'S TWO WAYS TO DO THIS, EITHER USING THE BUILDING AREA METHOD OR USING A SPACE-BY-SPACE METHOD. THE BUILDING AREA METHOD IS THE SIMPLEST APPROACH. AND THIS IS FOR PROJECTS INVOLVING AN ENTIRE BUILDING, NEW CONSTRUCTION, A SINGLE INDEPENDENT OR SEPARATE OCCUPANCY IN A MULTI-OCCUPANCY BUILDING. SO, LET'S SAY YOU HAVE A FOUR-STORY BUILDING WITH THE FIRST FLOOR AS RETAIL AND THE TOP FIVE FLOORS ARE ALL OFFICE, YOU COULD USE THE WHOLE BUILDING APPROACH FOR THIS. THE RETAIL WHOLE BUILDING APPROACH FOR THE FIRST FLOOR, AND THE OFFICE WHOLE BUILDING NUMBER FOR THE UPPER FLOORS. THERE IS A TABLE LISTED AND YOU SELECT A REASONABLY, OR IF-- THERE ARE MANY BUILDING TYPES LISTED, BUT IF YOUR BUILDING TYPE IS NOT LISTED, YOU COULD SELECT A EQUIVALENT BUILDING TYPE, AND YOU MULTIPLY THE GROSS LIGHTED AREA BY THE ALLOWANCE GIVEN. AND I'LL TALK ABOUT THIS A LITTLE BIT MORE. THE FIRST QUESTION MIGHT BE, WHAT IS THE GROSS LIGHTED AREA? HOW YOU DETERMINE THAT? AND THAT'S THE SUM OF THE TOTAL LIGHTED AREA OF THE BUILDING, AND THIS WOULD BE MEASURED FROM THE EXTERIOR FACES OF THE EXTERIOR WALLS TO THE CENTER LINE OF THE INTERIOR WALLS, WHERE THE WALLS SEPARATING BUILDINGS OR SPACES ARE USED IN THE BUILDING AREA METHOD OF DETERMINING INTERIOR LIGHTING POWER ALLOWANCE. ALSO, THE GROSS LIGHTED AREA ALSO IS USED IN THE SPACE-BY-SPACE METHOD, AS WELL. BUT FOR EACH INDIVIDUAL SPACE, SOMETHING VERY SIMILAR IS USED. NOW, THERE IS A WHOLE TABLE OF WATTS PER SQUARE FOOT FOR DIFFERENT BUILDING TYPES. AND, THE QUESTION WE OFTEN GET IS, HOW IS THIS ARRIVED AT? NOW, IN THE '89 STANDARD, THESE NUMBERS WERE ARRIVED AT BY CONSENSUS. SO, A LOT OF LIGHTING PRACTITIONERS WHO WERE FAMILIAR WITH LIGHTING DESIGN, AS WELL AS OTHER INTERESTED PARTIES, SAT AROUND AND DEVELOPED A PROFESSIONAL CONSENSUS AS TO WHAT THE WATTS PER SQUARE FOOT SHOULD BE FOR VARIOUS BUILDING TYPES. IN THE '99 VERSION, WE DECIDED TO MODIFY THAT QUITE SUBSTANTIALLY, AND WE PUT IN PLACE A MUCH MORE RIGOROUS PROCESS WHERE WE LITERALLY WENT OUT AND WE MODELED MANY DIFFERENT BUILDING TYPES. WE FIRST WENT AND GOT A LOT OF NEW CONSTRUCTION DRAWINGS TO MODEL THIS ON BUILDINGS

THAT WERE BEING BUILT TODAY OF ALL DIFFERENT TYPES. HOSPITALS AND CHURCHES AND POLICE STATIONS AND OFFICE BUILDINGS AND ON AND ON. WE WENT THROUGH THESE VARIOUS TYPES AND WE ACTUALLY DID TAKEOFFS AND DETERMINED WHAT DIFFERENT TYPES OF SPACES WERE IN EACH OF THESE BUILDING TYPES, AS CURRENTLY BEING DESIGNED. AND THEN WE APPLIED LIGHTING DESIGNS TO EACH OF THESE VARIOUS SPACES. WE RACKED THIS ALL UP BY USING CURRENT PERFORMANCE DATA OF THE CURRENTLY AVAILABLE EQUIPMENT. WE UPDATED EFFICIENCY AND LIGHT LOSS FACTORS WITHIN THIS MODEL. AND WE APPLIED RECOMMENDED LIGHT LEVELS, ALONG WITH PROFESSIONAL LIGHTING DESIGN CONSENSUS. THIS WAS ALL WRAPPED INTO A MODEL, AND THE MODEL ITSELF PRODUCED A WATTS PER SQUARE FOOT. SO, IN THE '99 STANDARD, THIS IS BASED ON ACTUAL LIGHTING DESIGNS THAT WERE DEVELOPED AND CONCEIVED FOR THESE VARIOUS BUILDINGS. SO THERE'S A LOT OF RIGOROUS WORK THAT WENT BEHIND IT TO MAKE SURE THESE WATTS PER SQUARE FOOT NUMBERS INDEED COULD BE MET WITH PROPER LIGHTING DESIGN. AND OUT OF THAT MODEL, MODELING SYSTEM, CAME THE VARIOUS WATTS PER SQUARE FOOT LIMITS. AND YOU SEE SOME OF THEM LISTED HERE. THE LIST IN THE STANDARD IS MUCH LONGER. BUT HERE'S SOME OF THE MORE COMMON SPACES. A HOSPITAL AT 1.6 WATTS PER SQUARE FOOT, A LIBRARY AT 1.5 WATTS PER SQUARE FOOT, MANUFACTURING AT 2.2, MUSEUM AT 1.6, OFFICE AT 1.3, A PARKING GARAGE AT 0.3, OBVIOUSLY NEEDING MUCH LOWER LIGHTING LEVELS. RETAIL AT 1.9, AND A SCHOOL AT 1.5. USING THE WHOLE BUILDING METHOD, WE HAVE ANOTHER EXAMPLE SHOWN HERE OF HOW YOU WOULD USE THIS TO DETERMINE IF YOU COMPLIED. SO, IN THIS EXAMPLE, WE HAVE AN OFFICE BUILDING OF SIX FLOORS, OUTSIDE DIMENSIONS, 200 BY 350. THE OFFICE BUILDING POWER ALLOWANCE, WE WOULD LOOK ON OUR TABLE BETWEEN STANDARDS AND WE'D FIND IT'S 1.3 WATTS PER SQUARE FOOT FOR THE BUILDING. THE SOLUTION IS A FAIRLY SIMPLE ONE, AND THIS IS OBVIOUSLY THE EASIEST WAY TO COMPLY. YOU SIMPLY GET THE TOTAL SQUARE FOOTAGE OF THE BUILDING, IN THIS CASE, 70,000 SQUARE FOOT PER FLOOR, A TOTAL OF 420,000 SQUARE FEET. YOU MULTIPLY THIS BY 1.3 WATTS PER SQUARE FOOT. THE TOTAL AMOUNT OF WATTAGE IS 546,000 WATTS, OR 546 KILOWATTS. AND ONCE YOU HAVE THAT AS YOUR LIGHTING BUDGET, YOU CAN USE THAT HOWEVER YOU WANT. USING THE WATTAGE THAT YOU ADDED UP, AS WE DESCRIBED PREVIOUSLY, YOU WOULD COMPARE THAT WATTAGE OF YOUR DESIGN VERSUS THIS WATTAGE ALLOWANCE. AND YOU CAN VARY THE WATTAGE WITHIN THE BUILDING, CAN VARY THE LIGHTING WITHIN THE BUILDING BY MOVING MORE LIGHTING INTO ONE AREA, MOVING LIGHTING OUT OF ANOTHER AREA. BUT YOU COULD USE IT WHEREVER YOU'D LIKE WITHIN THE SPACE. SO IT GIVES THE DESIGNER MAXIMUM FLEXIBILITY TO DESIGN THE BUILDING PROPERLY. NOW, IF YOU'RE NOT DOING A COMPLETE BUILDING, THE OTHER OPTION WITHIN THE STANDARD IS TO USE THE SPACE-BY-SPACE METHOD. THIS IS VERY COMMON IF YOU'RE DOING SPECULATIVE OFFICE BUILD OUTS, OR PERHAPS YOU'RE IN A SHOPPING MALL WHERE EACH STORE IS BUILDING SOLD AND DESIGNED SEPARATELY. YOU WOULD NOT BE ABLE TO USE THE WHOLE BUILDING METHOD, BUT YOU'D HAVE TO LOOK AT EACH SPACE INDIVIDUALLY. THE WAY TO USE THE SPACE-BY-SPACE METHOD, IDENTIFY DIFFERENT BUILDING TYPES WITHIN YOUR PROJECTS OR DIFFERENT SPACE TYPES WITHIN THE PROJECT. DIVIDE THE GROSS LIGHTED AREA OF THE BUILDING INTO EACH OF THE SPACE TYPES. CALCULATING THE LIGHTING POWER ALLOWANCE, VERY SIMILAR TO THE BUILDING METHOD, BUT HERE YOU WOULD DO IT ON A SPACE-BY-SPACE METHOD AND SUM THEM ALL UP. YOU WOULD TREAT EACH SPACE INDIVIDUALLY, AND EACH WOULD HAVE ITS OWN WATTAGE POWER LIMIT. THIS GIVES YOU MUCH MORE FLEXIBILITY, AND IT'S APPLICABLE TO ALL BUILDINGS. IN FACT, EVEN IF YOU'RE DOING AN ENTIRE BUILDING, A WHOLE BUILDING, YOU CAN USE THE SPACE-BY-SPACE METHOD IF IT MIGHT GIVE YOU ADDITIONAL POWER OR ADDED FLEXIBILITY. IT ESPECIALLY COULD BE USEFUL IF YOU HAVE AN ATYPICAL BUILDING THAT HAS A LOT OF UNUSUAL SPACES IN IT THAT REQUIRE MORE LIGHTING POWER THAN THE BUILDING TYPE MODELED IN THE WHOLE

BUILDING METHOD. THERE IS A TABLE WITHIN THE STANDARD ON THAT TABLE IS DIFFICULT TO READ HERE, BUT IF YOU LOOK IN THE STANDARD, YOU'LL FIND THESE TABLES OF VARIOUS BUILDING TYPES, ALONG WITH VARIOUS COMMON SPACE TYPES LISTED VERTICALLY. AND THEN DOWN THE LAST COLUMN ARE UNIQUE SPACES, FOR INSTANCE, THEY HAVE PLAYING AREA OR GYMNASIUM AREA IN VARIOUS BUILDING TYPES. AND CAN YOU SEE THE STANDARD, YOU CAN SEE THESE UNIQUE BUILDING TYPES LISTED ON THE RIGHT-HAND COLUMN. THE OTHER THING WITHIN THE SPACE-BY-SPACE METHOD IS THERE'S ADDITIONAL FLEXIBILITY FOR SPECIFIC LIGHTING SITUATIONS. AND THESE WILL GIVE YOU ADDITIONAL INTERIOR LIGHTING POWER. THERE ARE THREE CASES WHERE YOU CAN GET ADDITIONAL INTERIOR LIGHTING POWER. FOR DECORATIVE LUMINARIES, WHERE YOU HAVE THEM, YOU CAN GET ADDITIONAL ONE WATT PER SQUARE FOOT. THIS IS WHERE YOU HAVE DECORATIVE EQUIPMENT. SO THIS ADDITIONAL POWER GOES TO THE AVAILABILITY OF THE EQUIPMENT. IF THE EQUIPMENT IS USED, YOU GET THIS ADDITIONAL POWER. THE SECOND IS USING FLUORESCENT LUMINARIES DESIGNED TO DECREASE GLARE. HERE YOU WOULD GET AN ADDITIONAL 0.35 WATTS PER SQUARE FOOT. AND THEN FINALLY, FOR RETAIL LIGHTING, WE'RE USING ACCENT LIGHTING, YOU CAN GET AN ADDITIONAL 1.6 WATTS PER SQUARE FOOT FOR RETAIL LIGHTING. OR, IF YOU ARE LIGHTING FINE MERCHANDISE, SUCH AS A JEWELRY STORE, YOU COULD GET AN ADDITIONAL 3.9 WATTS PER SQUARE FOOT ON TOP OF THE BASIC WATTS PER SQUARE FOOT ALLOWED FOR RETAIL SPACES. >> JOE, A COUPLE OF QUICK QUESTIONS ON THIS SLIDE. FIRST, COULD YOU, FOR THOSE WHO MAY BE UNFAMILIAR WITH THE PUBLICATIONS, CAN YOU SHARE WITH THE VIEWERS WHAT THE IES RP-1 DOCUMENT IS? >> YES. THAT'S A GOOD QUESTION, RON. RP-1 IS A RECOMMENDED PRACTICE ONE FOR OFFICE SPACE OR OFFICE BUILDING DESIGN. WITHIN THAT DOCUMENT ARE SPECIFICATIONS FOR SPACES WHERE YOU NEED TO DESIGN THE LIGHTING TO ELIMINATE COMPUTER, TO ELIMINATE GLARE ON A COMPUTER SCREEN. THIS DETAILS HOW THE LIGHT CAN BE EMITTED FROM THE FIXTURE. ESSENTIALLY, WE DON'T WANT LIGHT EMITTED AT HIGH ANGLES THAT CAN CAUSE GLARE. SO, IT TENDS TO CONCENTRATE THE LIGHT DOWN INTO A NARROW, MORE VERTICAL BEAM OR INDIRECTLY AGAINST THE CEILING. WHEN YOU DO THAT, OFTEN YOU HAVE TO ADD ADDITIONAL POWER TO DO ADDITIONAL WALL LIGHTING OR PERHAPS ADDITIONAL TASK LIGHTING. AND, THEREFORE, THE STANDARD ALLOWS FOR A LITTLE BIT EXTRA WATTAGE WHEN YOU PUT IN THOSE, SAY, SYSTEMS OR PERHAPS AN INDIRECT LIGHTING SYSTEMS. >> GOOD. ON THE ACCENT LIGHTING, YOU TALKED ABOUT ADDITIONAL POWER ALLOWANCES. I'M ASSUMING THAT POWER ALLOWANCE CAN BE ADDED TO THE BASE POWER ALLOWANCE FOR THE SPACE. AND TELL ME IF I'M CORRECT IN THAT. AND ALSO THE QUESTION I HAVE IS, ONCE YOU'VE DONE THAT, CAN THAT ADDITIONAL ALLOWANCE BE USED IN TRADE-OFF ACROSS THE BUILDING SPACES? >> IT'S ALSO A GOOD QUESTION. IT CAN BE ADDED TO THE BASE WATTAGE FOR THAT PARTICULAR SPACE. BUT IT CAN ONLY BE USED FOR THE ACCENT LIGHTING. AGAIN, IT'S USE IT OR LOSE IT. SO YOU CANNOT USE THAT AS A TRADE-OFF, THAT ACCENT LIGHTING BUDGET AS A TRADE-OFF FOR OTHER PARTS OF THE BUILDING. >> OKAY. THAT'S A GOOD CLARIFICATION. THANKS, JOE. >> THANKS, RON. SO, PERHAPS THE EASIEST WAY TO TALK ABOUT THIS, OR DESCRIBE THIS, IS TO GO THROUGH ANOTHER EXAMPLE OF HOW YOU MIGHT USE THE SPACE-BY-SPACE METHOD. IN THIS CASE, WE'RE GOING TO CALCULATE AN EXAMPLE WHERE WE HAVE A RETAIL BUILDING, AND THIS RETAIL BUILDING WE HAVE 5,000 SQUARE FEET OF SALES STORE, A SALES AREA. AND WE'RE GOING TO REQUIRE SOME GENERAL ACCENT LIGHTING IN THIS SPACE. WE HAVE 1,000 SQUARE FOOT OF ACTIVE STORAGE AREA, THREE ENCLOSED OFFICES, EACH 200 SQUARE FEET. ONE CONFERENCE ROOM, 400 SQUARE FEET, TWO REST ROOMS AT 150 SQUARE FEET EACH, AND THEN A CORRIDOR, WHICH IS SIX FOOT WIDE BY 25 FEET LONG. AND THIS MIGHT BE A VERY TYPICAL RETAIL SPACE WITHIN A MALL. THE APPROACH TO SOLVING THIS, OR DETERMINING WHAT MY BUDGET LIMIT IS FOR THIS SPACE, IS AT FIRST I HAVE TO GO INTO THE STANDARD AND IDENTIFY EACH SPACE, AND IDENTIFY

EACH OF THE WATT PER SQUARE FOOT LIMITATIONS FOR THAT SPACE. SO, FOR INSTANCE, WE GO INTO THE STANDARD, WE FIND THAT THE SALES AREA HAS A LIMIT OF 2.1 WATTS PER SQUARE FOOT. AND WE ALSO FIND, FOR ACCENT LIGHTING, WE'RE ALLOWED AN ADDITIONAL 1.6 WATTS PER SQUARE FOOT. THE ACTIVE STORAGE AREA, WE'RE ALLOWED 1.1 WATT PER SQUARE FOOT. ENCLOSED OFFICES, 1.5. CONFERENCE ROOM, THE SAME, REST ROOMS, ONE WATT A SQUARE FOOT AND CORRIDORS, 0.7 WATT PER SQUARE FOOT. AND THEN, IT'S SIMPLY A CALCULATION WHERE WE MULTIPLY EACH OF THESE VALUES TIMES THE SQUARE FOOTAGE OF THE SPACE, AND WE SUM UP THE WATTAGES. AND WHEN WE GET DONE SUMMING UP THE WATTAGES FOR THE SALES AREA, THE STORAGE AREA, ENCLOSED OFFICES AND SO FORTH, WE COME OUT WITH A TOTAL BASE WATTAGE ALLOWANCE OF 13,505 WATTS. IN ADDITION, WE CAN PUT ACCENT LIGHTING IN THE SPACE, WHICH IS A SEPARATE CALCULATION, 1.6 WATTS PER SQUARE FOOT TIMES 5,000 FEET, OR AN ADDITIONAL 8,000 WATTS. AND THAT 8,000 WATTS CAN ONLY BE USED FOR ACCENT LIGHTING. YOU DON'T HAVE TO USE ALL THE 8,000 WATTS, BUT THAT IS THE MOST ACCENT LIGHTING THAT YOU CAN PUT IN THIS SPACE UNDER THE CODE. THE BASE WATTAGE OF 13,505 WATTS, ONCE THAT'S ESTABLISHED, YOU CAN TRADE THAT OFF. SO, FOR INSTANCE, IF YOU WANT TO PUT LESS LIGHTING IN THE OFFICES OR THE BACK STORAGE AREA, AND TRY TO MOVE MORE UP INTO THE STORE SPACE, YOU CAN DO THAT. ONCE THAT BUDGET IS ESTABLISHED, YOU SORT OF CAN TOSS ALL THESE INDIVIDUAL NUMBERS AWAY AND YOU CAN USE THAT WATTAGE WHEREVER YOU WANT WITHIN THAT STORE SPACE, WITH THE EXCEPTION OF THE ACCENT LIGHTING WATTAGE, WHICH YOU CAN ONLY USE FOR ACCENT LIGHTING. FINALLY, I'D LIKE TO END THE PRESENTATION BY TALKING A LITTLE BIT ABOUT THE OUTDOOR LIGHTING REQUIREMENTS. FOR THE OUTDOOR LIGHTING REQUIREMENTS, THERE'S TWO GENERAL AREAS. THE FIRST AREA IS THE EXTERIOR BUILDING GROUNDS LIGHTING. FOR EXTERIOR BUILDING GROUNDS LIGHTING, IF THEY OPERATE AT GREATER THAN 100 WATTS, MUST USE A LAMP WITH A SOURCE EFFICACY OF GREATER THAN 60 LUMENS PER WATT. WHAT THIS MEANS IS THAT FOR MOST OUTDOOR EXTERIOR GROUNDS LIGHTING, YOU WOULD HAVE TO USE A SOURCE SUCH AS A HIGH-PRESSURE SODIUM OR METAL HALIDE OR A FLUORESCENT SOURCE. BUT YOU COULD NOT USE HIGH WATTAGE INCANDESCENT LAMPS OR MERCURY LAMPS FOR GROUNDS LIGHTING AND MEET THE STANDARD. THERE ARE EXCEPTIONS FOR TRAFFIC SIGNALS, LIGHTING USED WITHIN OUTDOOR SIGNS, LIGHTING USED TO ILLUMINATE PUBLIC MONUMENTS OR REGISTERED HISTORIC LANDMARKS, AND ALSO THERE'S AN EXCEPTION, PROBABLY THE MOST INTERESTING EXCEPTION IS THE ONE, IF A MOTION SENSOR CONTROLS THE LIGHTING APPLICATION. AND THIS IS INTERESTING IN THAT IT WOULD ALLOW YOU TO USE AN INCANDESCENT SOURCE THAT'S GREATER THAN 100 WATTS IF YOU HAVE IT ON A MOTION SENSOR. THE REASON FOR THIS EXCEPTION HAS TO DO WITH SAFETY AND SECURITY. WITH SAFETY AND SECURITY LIGHTING, YOU CAN CONCEIVE OF A SITUATION WHERE PERHAPS YOU WALK INTO AN ALLEYWAY, IT'S DARK AT NIGHT, THERE'S A MOTION SENSOR THERE, YOU WANT TO IMMEDIATELY FLOOD THAT ALLEYWAY WITH LIGHT. YOU'D DO THIS WITH A HALOGEN FIXTURE, 500-WATT. WHEN YOU DO THIS, THE LIGHTING IMMEDIATELY COMES ON AND IT'S VERY BRIGHT. WHEN THE PERSON LEAVES THAT SPACE, AFTER FIVE OR TEN MINUTES, THE LIGHT WILL GO OUT AFTER THE MOTION SENSOR NO LONGER SENSES MOTION. IT'S VERY HARD TO GET THAT KIND OF SECURITY LIGHTING WITH AN HID SOURCE. IF YOU HAD METAL OR HIGH-PRESSURE SODIUM, IT WOULD NOT COME IMMEDIATELY ON. IT WOULD TAKE ONE, TWO MINUTES, MAYBE FIVE TO TEN MINUTES TO WARM UP TO FULL BRIGHTNESS. SO, FOR THAT APPLICATION, THERE IS AN EXCEPTION. AND, FINALLY, FOR EXTERIOR BUILDING LIGHTING, THERE ARE DIFFERENT WATT LIMITATIONS FOR EXTERIOR BUILDING LIGHTING DEALING WITH THE ENTRANCES OF BUILDINGS AND DEALING WITH THE EXITS OF BUILDINGS. FOR THE BUILDING ENTRANCE CANOPIES, IT'S THREE WATTS PER SQUARE FOOT. THIS WOULD ALSO INCLUDE FREESTANDING CANOPIES, SUCH AS THOSE FOUND ON GAS STATIONS. FOR ENTRANCES AND EXITS, YOU GET 33 WATTS PER LINEAR FOOT FOR THE ENTRANCE, 20 WATTS FOR THE EXITS.

AND WHEN I FIRST JOINED THE COMMITTEE, I ASKED THEM, WHAT'S THE DIFFERENCE BETWEEN AN ENTRANCE AND AN EXIT? AND THE COMMITTEE TOLD ME THAT DEPENDS ON WHETHER YOU'RE COMING OR YOU'RE GOING. WHICH WAS SORT OF AN INTERESTING RESPONSE. BUT OBVIOUSLY, WHAT THE ANSWER TO THAT IS THAT THE BUILDING ENTRANCE IS THE MAIN, PRIMARY ENTRANCE TO THE BUILDING, SOMETIMES WITH A CANOPY ON IT, AND IT'S FAIRLY CLEAR WHERE THAT IS. AND THE EXIT POWERS FOR ALL THE EXITS AROUND THE BUILDING. THOSE THREE WATTAGES CAN BE TRADED OFF. SO YOU CAN ADD UP A TOTAL BUDGET FOR YOUR CANOPY FOR ENTRANCES AND EXITS, GET A TOTAL BUDGET FOR THE EXTERIOR OF THE BUILDING, AND THEN YOU CAN TRADE OFF THAT WATTAGE SOMEWHAT BY PERHAPS, IF YOU WANT TO MOVE MORE WATTAGE UP TO THE FRONT, AND HAVE A LITTLE LESS IN THE BACK, YOU CAN DO THAT. THE LAST REQUIREMENT, BUILDING FACADE, IT'S MORE OF A USE IT OR LOSE IT REQUIREMENT. IF YOU'RE GOING TO LIGHT ONE OF THE WALLS OF A BUILDING, YOU GET 0.25 WATTS PER SQUARE FOOT. YOU ONLY GET THIS WATTAGE FOR THE SIDE OF THE BUILDING THAT YOU'RE LIGHTING. SO YOU WOULDN'T ADD UP ALL FOUR SIDES IF, INDEED, YOU'RE GOING TO LIGHT THE FRONT OF THE BUILDING. IF YOU'RE GOING TO LIGHT ALL FOUR SIDES, THEN, YES, YOU CAN USE THE WATTAGE, JUST THE TOTAL PROJECTED VERTICAL AREA OF THE BUILDING ON ALL FOUR SIDES TIMES .025 WATTS PER SQUARE FOOT. AND I WOULD LIKE TO END JUST WITH SOME COMMENTS ABOUT THE ADDENDUM. THERE ARE SEVERAL ADDENDUM THAT WERE PROPOSED IN THE LAST YEAR OR TWO. MANY OF THEM WERE MODIFICATIONS OR CLARIFICATIONS TO THE STANDARD TO THE LIGHTING PART OF THE STANDARD. ONE, IN PARTICULAR, HAD TO DO WITH THE AUTOMATIC LIGHTING SHUT-OFF REQUIREMENT. THE ADDENDA WILL, HAS A COUPLE OF CLARIFICATIONS TO IT. IT SAYS THAT THIS MOTION CONTROL CAN OPERATE ON A SCHEDULED BASIS, SUCH AS WITH A PROGRAMMABLE LIGHTING CONTROL. IT CAN OPERATE ON AN OCCUPANCY SENSOR BASIS, OR THE ADDENDUM IS THAT IT CAN USE THE SIGNAL FROM ANOTHER CONTROL OR ALARM SYSTEM INDICATING THE AREA IS UNOCCUPIED. THIS WOULD BE IN A CASE WHERE PERHAPS YOU HAVE A RETAIL STORE, IT HAS A SECURITY SYSTEM, AND YOU WANT IT TO HOOK IN THE SHUT-OFF OF THE LIGHTING SYSTEM WITH THE SECURITY SYSTEM, ACTIVATION OF THE SECURITY SYSTEM. SO, IN THIS CASE, AS YOU'RE LEAVING THE BUILDING, YOU'RE GOING TO ACTIVATE THE SECURITY SYSTEM. IF YOU HAVE THAT LOCKED INTO THE LIGHTING SYSTEM AND MAKE SURE THAT ALL THE GENERAL LIGHTING CIRCUITS ARE LOCKED OFF AT THAT TIME, THAT WOULD COMPLY WITH THE AUTOMATIC SHUT-OFF. AND THERE'S ALSO AN OCCUPANT OVERRIDE ALLOWANCE, AS WELL, WITHIN THE ADDENDUM TO ALLOW YOU TO ADJUST OR OVERRIDE THE AUTOMATIC CONTROL SYSTEM WHERE NECESSARY.

>> OKAY. THAT BRINGS US TO THE END OF THE PRESENTATION. THANK YOU, JOE. AND IT'S TIME FOR QUESTIONS. YOU'LL SEE ON THE SCREEN THE NUMBER FOR BOTH CALL-IN AND FAX-IN QUESTIONS. I WOULD ENCOURAGE YOU TO TAKE ADVANTAGE OF THAT. I UNDERSTAND WE DO HAVE A CALLER ON THE LINE RIGHT NOW. CALLER, GO AHEAD. >> YES, THIS IS KEVIN, I'M CALLING FROM PENNSYLVANIA. >> HI. >> MY QUESTION IS, THE ASHRAE STANDARDS FOCUSES ON THE ENERGY CONSUMPTION BUT DOES NOT ADDRESS THE ILLUMINATION FOR THESE SPACES. COULD YOU EXPLAIN WHY THEY HAVEN'T BEEN DEFINED IN THE STANDARD? >> OKAY. JOE, WOULD YOU LIKE TO ADDRESS THE QUESTION? FOR THE STUDIO AUDIENCE, THE QUESTION WAS, THE ASHRAE STANDARD FOCUSES ON THE ENERGY CONSUMPTION AND DOESN'T ADDRESS THE ILLUMINATION, AND WHY HAVE THEY NOT BEEN COMBINED IN THE STANDARD? >> THANKS, RON. WELL, THAT IS A GOOD QUESTION. AND THE LIGHTING CONSIDERATION HAS LIGHTING QUALITY, LIGHTING LEVELS, HAVE BEEN CONSIDERED IN THE MODEL DEVELOPMENT OF THE STANDARD. BUT THE STANDARD BY ITSELF IS JUST FOCUSED ON ENERGY. BUT WE USED A LOT OF THE IES RECOMMENDATIONS FOR LIGHTING LEVELS WITHIN THE MODELS. IF YOU'RE INTERESTED IN HOW THESE MODELS WERE DEVELOPED OR HOW THESE LIGHTING MODELS WERE DEVELOPED, THEY ARE ON THE IES WEBSITE. SO IF YOU GO INTO THE WEBSITE AND YOU CLICK ON CODE MODEL DEVELOPMENT, OR LPD MODEL

DEVELOPMENT, THE LINK HAS SOME KIND OF A DESCRIPTION SIMILAR TO THAT, YOU COULD LOOK AT THE VARIOUS MODELS AND YOU COULD SEE WHERE GOOD LIGHTING WAS CONSIDERED AND THE VARIOUS ASSUMPTIONS WERE. AND SO, ALTHOUGH THE CODE DOESN'T SPECIFICALLY ADDRESS THAT, CERTAINLY GOOD LIGHTING AND MEETING GOOD LIGHTING REQUIREMENTS WERE TAKEN INTO ACCOUNT IN A BIG WAY WHEN WE WERE DEVELOPING THE WATTS PER SQUARE FOOT NUMBERS. >> OKAY. I THINK WE HAVE ANOTHER CALLER. >> HELLO? >> HELLO. >> YES. HELLO. I'M CALLING, TRYING TO FIND OUT HOW TASK LIGHTING GOES AND PLAYS IN WITH THE TOTAL POWER DENSITY REQUIREMENTS, IF THAT'S GOING TO BE COUNTED AGAINST IT OR IF IT'S BUDGETED SEPARATELY. >> OKAY. FOR THE STUDIO AUDIENCE, THE QUESTION IS, HOW DOES TASK LIGHTING PLAY INTO THE TOTAL LIGHTING POWER BUDGET? IS IT INCLUDED IN THE TOTAL BUDGET, OR IS IT DEALT WITH SEPARATELY? JOE? >> THANKS, RON. THE TASK LIGHTING IS INCLUDED TO THE EXTENT THAT IT IS ON THE SPECIFICATIONS. OBVIOUSLY, SOME TASK LIGHTING IS BROUGHT IN AFTER THE FACT, OR AFTER THE GENERAL LIGHTING SYSTEM IS DESIGNED. SOMEBODY RENTS THE SPACE AND FURNITURE IS BROUGHT IN AFTERWARDS, SOME OF IT MAY INCLUDE TASK LIGHTING. IT'S VERY HARD TO PREDICT HOW MUCH PORTABLE LIGHTING OR TASK LIGHTING MIGHT BE BROUGHT INTO THE SPACE. BUT IN TERMS FOR CODE COMPLIANCE, IF YOU KNOW THAT THERE IS GOING TO BE CERTAIN FURNITURE THAT HAS TASK LIGHTING IN A SPACE, THAT TASK LIGHTING SHOULD BE CONSIDERED WITHIN THE TOTAL WATTAGE USED FOR COMPLIANCE WITH THE CODE. SO, ESSENTIALLY IF WE KNOW IT'S GOING TO BE THERE, YES, IT IS INCLUDED AS PART OF THE OVERALL WATTAGE CONSIDERED FOR CODE COMPLIANCE. >> OKAY. LET'S PICK UP A COUPLE OF OUR FAX-IN QUESTIONS HERE. FIRST ONE IS, WHY IS ASHRAE INVOLVED IN LIGHTING STANDARDS? >> OKAY. WELL, THE STANDARD IS A JOINT STANDARD. IT IS A JOINT ASHRAE, IES STANDARD. AND IT IS THAT IES BRINGS THE LIGHTING ASPECT TO THE STANDARD, AND IT'S MAINLY IES MEMBERS THAT ARE ON THE LIGHTING SUBCOMMITTEE THAT ARE INVOLVED WITH THE DEVELOPMENT OF THE LIGHTING PORTION OF THE STANDARD. >> I MIGHT ADD TO THAT, THAT THERE IS AN OFFICIAL CO-SPONSORSHIP AGREEMENT BETWEEN THE TWO ORGANIZATIONS. AND IN FACT, A QUARTER OF THE PROJECT COMMITTEE IS MADE UP OF MEMBERS OF THE ILLUMINATING ENGINEERING SOCIETY. SO, THE ATTEMPT HERE IS TO HAVE AN INTERVIEW STANDARD THAT FULLY ADDRESSES ALL OF THE MAJOR SIGNIFICANT ENERGY USERS UNDER ONE ROOF. AND THROUGH THE COOPERATION WITH IESNA, WE'RE ABLE TO ACHIEVE THAT. OKAY. DO WE HAVE A CALLER ON THE LINE? OKAY, CALLER, GO AHEAD. >> YES. I HAVE A QUESTION. HOW DO YOU HANDLE THE MULTIPURPOSE ROOMS VERY SIMILAR TO LIKE IN ELEMENTARY SCHOOLS, WHERE WE HAVE A CAFETERIA THAT ALSO IS USED AS A STAGE FOR TALENT SHOW, AND THEN ALSO IS USED FOR PTA MEETINGS? OR, IN ANOTHER CASE, WE HAVE A CHAPEL THAT IN TURN IS USED AS TRAINING ROOM FOR THE INSTITUTION. >> OKAY. >> HOW WOULD YOU HANDLE THE ROOMS? >> THE QUESTION FOR THE STUDIO AUDIENCE IS, HOW DO YOU HANDLE MULTIPURPOSE ROOMS? ONE EXAMPLE GIVEN WAS A SCHOOL WHERE YOU MIGHT HAVE A CAFETERIA, AUDITORIUM COMBINATION THAT'S USED FOR DIFFERENT APPLICATIONS AND MIGHT HAVE DIFFERENT LIGHTING ALLOWANCES. JOE, CAN YOU RESPOND TO THAT? >> YES, RON. THERE IS A^-- ONE OF THE SPACE-BY-SPACE OPTIONS IS A MULTIPURPOSE ROOM. AND I DON'T REMEMBER THE EXACT WATTS PER SQUARE FOOT LIMITATION IN THERE, BUT THERE IS A WATTS PER SQUARE FOOT LIMITATION FOR MULTIPURPOSE ROOMS. IF THE ROOMS ARE USED FOR GREATLY DIFFERENT PURPOSES, PERHAPS ONE USING A LOT OF INCANDESCENT VERSUS ONE USING A FLUORESCENT SYSTEM, AND YOU'RE HAVING A HARD TIME MEETING THE WATTS PER SQUARE FOOT REQUIREMENT FOR BOTH SYSTEMS, YOU CAN USE THE EXEMPTIONS ALLOWANCE, WHICH EXEMPTS ROOMS WHICH ARE INTERLOCKED. SO, IF YOU DESIGN VERY DIFFERENT SYSTEMS FOR INCANDESCENT VERSUS A FLUORESCENT SYSTEM, SUCH AS IN A CAFETERIA, AS LONG AS YOU INTERLOCK THEM, YOU SHOULD BE ABLE TO DESIGN THEM AND ONLY HAVE TO CONSIDER THE SPACE WITH THE HIGHEST WATTAGE NEED FOR CODE COMPLIANCE

PURPOSES. >> OKAY. LET'S GO BACK TO ONE OF THE FAXES HERE. AND THIS IS FROM JEFF IN CLEVELAND, OHIO. IN YOUR SOLUTION TO EXAMPLE ONE, WATTAGE CALCULATIONS, YOUR RIGHT WAY OF CALCULATING IT INDICATED EIGHT TWO-BY-FOUR FIXTURES AT 90 WATTS, BALLAST INPUT, AND A TOTAL OF 720 WATTS. THREE SCREENS PRIOR, YOU INDICATED THAT THE LUMINARIES WERE THE BALLAST, EQUAL TO THE COMBINATION. WHY WASN'T THE 32 WATTS PER LAMP CONSISTENT IN THIS EXAMPLE? >> YES. THAT'S A GOOD QUESTION. LAMPS ARE RATED BASED ON THEIR ANSI RATING. IT'S BASED ON WHAT THEY CALL A FULL BALLAST FACTOR, WHICH CONSIDERS THEY'RE OPERATED AT A CERTAIN DEFINED CURRENT BY CERTAIN AND INDUSTRY-DEFINED VOLTAGE. AND, THEREFORE, YOU GET AT THAT CERTAIN WATTAGE, 32 WATTS, YOU GET A CERTAIN LUMEN OUTPUT. WE DO THAT TO ALLOW THE DIFFERENT MANUFACTURERS TO RATE THEIR LAMPS ALL IN THE SAME WAY, AND ALLOW SPECIFIERS TO SPECIFY LAMPS ALL IN THE SAME WAY. HOWEVER, WHEN YOU GET INTO ACTUAL APPLICATIONS AND YOU HOOK THOSE UP TO BALLAST, REAL-WORLD BALLASTS USE DIFFERENT FACTORS. IF THE BALLAST FACTOR IS ONE, IT WOULD DRIVE THE LAMP EXACTLY AT 32 WATTS AND GIVE YOU THE EXACT LUMEN OUTPUT YOU SEE IN THE CATALOGS. BUT FOR VARIOUS REASONS, ESPECIALLY ELECTRIC BALLAST, THERE ARE FACTORS THAT ARE LOWER THAN ONE. 0.88 IS POPULAR TODAY. IF IT'S A 0.88 FACTOR, IT DRIVES THE LAMP AT 8% OF THAT WATTAGE AND ALSO GIVES YOU ESSENTIALLY 88% OF THE RATED LUMEN OUTPUT. SO YOU REALLY HAVE TO CONSIDER THE BALLAST FACTOR IN YOUR DESIGNS. CERTAIN BALLASTS ARE CALLED LOW-POWER BALLASTS. THEY MAY HAVE A FACTOR OF 0.78. THEY'RE DRIVING IT EVEN LOWER, BECAUSE PERHAPS IN THAT SPACE, THEY WANT A LOWER LIGHT LEVEL IN THAT PARTICULAR SPACE. STILL, THERE'S OTHER BALLASTS WITH FACTORS OF 1.2. HERE, THEY'LL OVERDRIVE THE LAMP BY 20%. AND IT GIVES THE DESIGNER MORE FLEXIBILITY IN TERMS OF THE NUMBER OF FIXTURES HE'S USING IN THE SPACE. OFTEN THEY'RE SET INTO A RIGID PATTERN, IN TERMS OF THEIR SPACING. AND THEN, BY VARYING THE BALLAST FACTORS, THEY CAN ACHIEVE THE EXACT LIGHT LEVEL THEY'RE TRYING TO ACHIEVE. AND SO IN THIS CASE, HERE YOU HAVE THREE 32-WATT LAMPS. THEY SHOULD GIVE YOU 96 WATTS, PLUS SOME LOSSES IN THE BALLAST, WHY ISN'T THAT CLOSER TO 100? IT'S BECAUSE IN THAT EXAMPLE, THE BALLAST FACTOR WAS 0.88. EACH OF THE LAMPS WAS BEING UNDER DRIVEN AS 85 WATTS, OR SOMETHING LIKE THAT, PLUS A LITTLE EXTRA FOR THE<sup>^</sup> OR UNDER DRIVEN TO 27 OR 28 WATTS, I MEAN. AND THEN A LITTLE EXTRA POWER FOR THE BALLAST GAVE YOU THE 90 WATTS. BUT IF YOU LOOK AT THE SPECIFICATIONS, IT WILL TELL YOU WHICH FACTORS ARE IN THAT FACTOR. >> I WANT TO ENCOURAGE OUR STUDIO AUDIENCE, IF THEY'D LIKE TO ASK A QUESTION, TO HOP UP TO THE MICROPHONE THERE AND WE WILL RECOGNIZE YOU. I THINK WE HAVE A CALLER ON THE LINE? DO WE? APPARENTLY, WE DON'T. SO WE'LL MOVE TO A FAX QUESTION. THIS IS FROM GRANT IN LONDON, ONTARIO, CANADA. PLEASE COMMENT ON THE APPLICATION OF THE NEW IESNA DOCUMENT ADDRESSING THE NEEDS OF THE SENIOR CITIZEN AND THEIR LIGHTING NEEDS. THIS IS RP-289. THIS GROUP NEEDS MUCH MORE LIGHTING, MUCH HIGHER LIGHTING LEVELS THAN NURSING HOMES, PARKING GARAGES, ET CETERA. ARE YOU FAMILIAR WITH THAT DOCUMENT, JOE? >> YES. THE IES DOCUMENT FOR THE ELDERLY OR SENIOR LIVING SPACES WAS PUBLISHED NOT TOO LONG AGO. IT'S A RELATIVELY RECENT DOCUMENT, A COUPLE OF YEARS OLD. AND THE COMMITTEE WAS WORKING ON ADDENDA, AND PERHAPS A NEW MODEL TO TAKE THAT INTO ACCOUNT. WHEN THIS, THE '99 STANDARD WAS WRITTEN, THAT RP WAS NOT YET COMPLETED, OR WAS JUST BEING COMPLETED JUST AS THE STANDARD WAS BEING FINALIZED. AND SO THERE WAS, SINCE THE STANDARD THAT WAS A NEW STANDARD, WE DID NOT HAVE A MODEL BUILD-IN FOR THAT. THERE ARE SOME EXCEPTIONS, OR EXEMPTIONS THAT MAY HELP IN TERMS OF LIGHTING FOR PEOPLE THAT HAVE POOR EYESIGHT, VISUALLY IMPAIRED, WHICH IN SOME CASES IS TRUE WITH SENIORS. BUT THE COMMITTEE DOES RECOGNIZE THERE'S A NEED TO DEVELOP A SOLUTION FOR SENIOR LIVING CENTERS. AND IT'S A GROWING NEED AND OBVIOUSLY IT'S A GROWING BUILDING TYPE THAT'S BEING

DEVELOPED. >> SO WE MIGHT EXPECT THAT TO BE FORTHCOMING? >> YES. I EXPECT THAT WILL BE ADDRESSED IN AN ADDENDA. >> THANKS, JOE. LET'S GO TO OUR STUDIO AUDIENCE. IF YOU'D IDENTIFY YOURSELF, PLEASE? >> MY NAME IS RANDY WILKINSON, AND I'M WITH INLAND EMPIRE CHAPTER. A QUICK QUESTION FOR YOU, JOE. WE SAW THE ENVELOPE COMMITTEE HAS SOFTWARE TO HELP THEM SHOW COMPLIANCE. IS THERE ANYTHING LIKE THAT AVAILABLE FOR THE LIGHTING? >> OKAY. I'M NOT AWARE OF A SPECIFIC PROGRAM THAT'S BEEN DEVELOPED YET FOR THE LIGHTING. I KNOW THAT IF YOU BUY THE USERS' MANUAL, YOU WILL GET A CD WITH THAT HAS COMPLIANCE FORMS THAT WILL HELP YOU WITH FIGURING OUT WHETHER OR NOT YOU COMPLY WITH THE LIGHTING PORTION OF THE STANDARD. >> OKAY. >> I MIGHT MENTION THAT THE PREVIOUS SOFTWARE THAT WAS AVAILABLE WITH THE '89 STANDARD WAS ESSENTIALLY BEAM COUNTING, OF COUNTING WATTS AND SPACES. AND I DON'T THINK ANYONE HAS PRODUCED ONE OF THOSE, AND PERHAPS THEY THOUGHT THAT THERE WASN'T AS MUCH OF A DEMAND, BUT MAYBE THE QUESTIONS MIGHT BE SUGGESTING THAT. I THINK WE HAVE A CALLER ON THE LINE. GO AHEAD. >> HELLO? >> HOW ARE YOU DOING? >> THIS IS CHARLES BOOTH FROM ATLANTA, GEORGIA. >> HOW ARE YOU DOING, CHARLES? >> HOW DO YOU TREAT INCANDESCENT LIGHTS THAT ARE ON A DIMMER? >> OKAY. SO, HOW DO YOU TREAT INCANDESCENT LIGHTS THAT ARE ON A DIMMER? >> YES. WELL, INCANDESCENT LIGHTS ON A DIMMER, YOU WOULD HAVE TO USE THE MAXIMUM WATTAGE RATING OF THE INCANDESCENT LIGHT WHEN IT WAS ON, WHEN THE DIMMER WAS FULL ON. THERE IS NO PARTICULAR CREDIT FOR DIMMING THE LIGHT DOWN. OBVIOUSLY WHEN IT'S DIMMED, IT WILL USELESS WATTAGE. BUT FOR CODE COMPLIANCE PURPOSES, YOU DO HAVE TO ASSUME THAT YOU USE THE MAXIMUM WATTAGE OF THAT LAMP. AND EVEN IF IT'S AN INCANDESCENT A-LINE LAMP THAT YOU'RE DIMMING, YOU HAVE TO ASSUME IT'S THE MAXIMUM RATE OF WATTAGE FOR THE FIXTURE. IT MAY BE HIGHER THAN THE LAMP THAT'S SPECIFIED IN THAT PARTICULAR CASE. >> OKAY. GREAT. WE'VE PROBABLY GOT TIME FOR ONE LAST FAX QUESTION. THIS IS FROM DAVID IN SPRINGFIELD, MISSOURI. DAVID SAYS, THE LIGHTING POWER ALLOWANCE EXEMPTION LISTS RETAIL DISPLAY WINDOWS, THAT'S IN QUOTES. RETAIL DISPLAYS OFTEN ARE NOT IN WINDOWS, SUCH AS MALLS, KIOSKS, ET CETERA. ARE THESE ALSO EXEMPT? IF NOT, WHY ARE WINDOWS SINGLED OUT? >> OKAY. THAT'S ALSO A GOOD QUESTION. THE RETAIL WINDOW, IF YOU READ THE STANDARD, IT GETS A LITTLE BIT MORE SPECIFIC, AND THE USER GUIDE HAS SOME VERY SPECIFIC EXAMPLES OF HOW TO APPLY THAT RETAIL WINDOW EXEMPTION. ESSENTIALLY IT EXISTS IF THE RETAIL WINDOW IS A SEPARATE SPACE THAT IS CUT OFF FROM THE INTERNAL PART OF THE STORE. A LOT OF TIME, LET'S SAY IN CITY STREETS, YOU MIGHT HAVE WINDOWS, DISPLAY WINDOWS, THE OUTSIDES ARE COMPETING AGAINST DAYLIGHT. THESE ARE ESSENTIALLY BOXES. AND VERY HIGH WATTAGE IS REQUIRED WITHIN THOSE SPACES TO TRY TO HIGHLIGHT THAT MERCHANDISE AGAINST THE DAYLIGHT. HOWEVER, IF YOU DON'T HAVE THAT SITUATION, OR IF YOU HAVE A SITUATION WHERE THE DISPLAY IS ACTUALLY CONNECTED TO THE INSIDE OF THE STORE, WHERE IT IS NOT A TOTALLY SEPARATE SPACE OR BOXED-OUT SPACE, IN THAT CASE, YOU COULDN'T USE THE DISPLAY LIGHTING EXEMPTION, BECAUSE IT'S CONSIDERED AS PART OF THE GENERAL STORE LIGHTING, AND YOU WOULD HAVE TO CONSIDER THAT LIGHTING AS PART OF THE OVERALL INTERIOR LIGHTING STORE BUDGET, IF IT'S NOT SEPARATED, IF IT'S PART OF THE INTERIOR PART OF THE STORE AS WELL. >> OKAY. JOE, I THINK THAT'S ALL THE TIME WE HAVE. I'M SORRY. COULD YOU ADVANCE THAT SLIDE FOR ME, PLEASE? THANKS A LOT FOR BEING WITH US TODAY. AND WE'VE BEEN TALKING ABOUT THE 90.1, 2001 STANDARD, WHICH IS AN UPDATE FROM THE '89 VERSION. IF YOU'RE INTERESTED IN WHERE YOU CAN GET A COPY OF THAT STANDARD, IT'S AVAILABLE FROM ASHRAE, THE ADDRESS

SHOULD APPEAR ON YOUR SCREEN, HOPEFULLY, WITH THE BOTH THE WEBSITE AND THE PHONE NUMBER FOR ORDERING THAT. AND FOR THOSE OF YOU WHO MIGHT NOT HAVE BEEN WATCHING EARLY ON, WE JUST GOT A DELIVERY HERE FROM FEDEX AT THE STUDIO WITH THE NEW VERSION OF THE STANDARD. SO, WE'RE ALL ARMED WITH OUR VERSION. WE HOPE YOU'LL GO OUT AND BECOME ARMED WITH YOURS. I'D LIKE TO THANK EVERYONE FOR JOINING US, BOTH OUR NATIONAL AUDIENCE AT THE 160 SITES, PLUS AROUND THE COUNTRY, AS WELL AS OUR STUDIO AUDIENCE, WHICH WAS PROVIDED GRATEFULLY BY THE INLAND EMPIRE CHAPTER OF ASHRAE. WE HOPE THAT YOU LEARNED SOMETHING ABOUT THIS STANDARD. IF YOU WANT TO KNOW EVEN MORE, AND THIS WAS IN MORE DETAIL FROM THE PREVIOUS PRESENTATION THAT WE DID LAST YEAR, IF YOU WANT TO KNOW EVEN MORE, I WOULD ENCOURAGE YOU TO TAKE ADVANTAGE OF THE ASHRAE PROFESSIONAL DEVELOPMENT SEMINARS WHICH ARE GOING TO BE OFFERED, STARTING IN 2002. THE FIRST ONE IS ALREADY SCHEDULED JANUARY 11th AND 12th FOR ATLANTIC CITY, IN CONJUNCTION WITH THE ASHRAE WINTER MEETING. THERE ARE TWO SUBSEQUENT TENTATIVE DATES ON MAY 15<sup>th</sup> AND 16<sup>th</sup> IN ST. LOUIS, AND NOVEMBER 20<sup>th</sup> AND 21<sup>st</sup> IN BALTIMORE, MARYLAND. PLEASE CHECK THE ASHRAE WEBSITE FOR DETAILS ON THOSE. THIS CONCLUDES OUR PRESENTATION. BUT I DO WANT TO ENCOURAGE YOU, AS WELL AS OUR ENTIRE BROADCAST, I DO WANT TO ENCOURAGE YOU TO COMPLETE THE SIGN-IN SHEETS AND THE EVALUATIONS THAT ARE AVAILABLE AT YOUR DOWNLINK SITE, AND SUBMIT THEM BACK TO US. IT'S VERY IMPORTANT FOR US TO BE ABLE TO REPORT TO THE PEOPLE THAT SPONSORED AND SUPPORTED THIS BROADCAST, AS WELL AS TO IMPROVE THE QUALITY OF ANY FUTURE ONES THAT WE MAY HAVE. AND ALSO IT'S HOW WE KNOW THAT YOU'RE ALL REALLY OUT THERE. SO YOU SIGNED UP ON THE WEBSITE, NOW, FOLLOW THROUGH AND GET THAT INFORMATION BACK TO US. IT'S VERY HELPFUL. AND A FINAL CLOSE, THANKS TO OUR GREAT PRESENTERS, TO MERYL, TO MICK AND TO JOE FOR TAKING THE TIME TO BE WITH US TODAY. ALL OF THESE FOLKS WORKED VERY HARD ON THE STANDARD, AND THEY WORKED VERY HARD TO TRY TO BRING THIS INFORMATION TO YOU TODAY. WE HOPE YOU ENJOYED IT. WE HOPE YOU LEARNED SOMETHING. AND WE HOPE TO HAVE THE OPPORTUNITY TO SEE YOU AGAIN. BYE-BYE.\_