TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

April 26, 1985

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of) Docket Nos. 50-390
Tennessee Valley Authority) 50-391

Based on the revised FSAR analysis on toxic gas protection, the chlorine detectors on the main control room ventilation system fresh air intake for Watts Bar Nuclear Plant are not required. Thus, technical specification (TS) 3.3.3.7 and surveillance requirement 4.7.7.e.4 should be deleted as shown on the enclosed marked up TS pages. Also enclosed are the revised FSAR changes which reflect the new analysis. These changes support TVA's decision to delete the main control room air intake chlorine detectors and will be incorporated into a subsequent amendment to the FSAR. The detectors are being removed since there is only a small quantity of chlorine stored onsite for laboratory use and to resolve NRC's concern with the present chlorine detector installation. Also, sodium hypochlorite is now used for water treatment instead of chlorine and analysis has shown that the negligible amounts of chlorine onsite and in close proximity of the plant serve no threat to the main control room operators. Therefore, it is not necessary to provide chlorine detectors per Regulatory Guide 1.95, even as a precautionary measure.

If you have any questions concerning this matter, please get in touch with D. B. Ellis at FTS 858-2681.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

J. A. Domer

J. A. Domer
Nuclear Engineer

Sworn to and subscribed before me
this 26th day of April 1985.

Paulette T. White
Notary Public

My Commission Expires 8-24-88

Enclosures
cc: U.S. Nuclear Regulatory Commission (Enclosures)
Region II
Attn: Dr. J. Nelson Grace, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

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INSTRUMENTATION

CHLORINE DETECTION SYSTEMS

LIMITING CONDITION FOR OPERATION

3.3.3.7 Two independent Chlorine Detection Systems, with their Alarm/Trip Setpoints adjusted to actuate at a chlorine concentration of less than or equal to 5 ppm, shall be OPERABLE.

APPLICABILITY: All Modes

ACTION:

a. With one Chlorine Detection System inoperable, restore the inoperable system to OPERABLE status within 7 days or within the next 6 hours initiate and maintain operation of the Control Room Emergency Ventilation System in the recirculation mode of operation.

b. With both Chlorine Detection Systems inoperable, within 1 hour initiate and maintain operation of the Control Room Emergency Ventilation System in the recirculation mode of operation.

c. The provisions of Specification 3.0.4 are not applicable.

SURVELLIANCE REQUIREMENTS

4.3.3.7 Each Chlorine Detection System shall be demonstrated OPERABLE by performance of a CHANNEL CHECK at least once per 12 hours, an ANALOG CHANNEL OPERATIONAL TEST at least once per 31 days and a CHANNEL CALIBRATION at least once per 18 months.

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~~4) Verifying that on a High Chlorine test signal, the system automatically switches into a recirculation mode of operation with flow through the HEPA filters and charcoal adsorber banks within 15 seconds.~~

f. After each complete or partial replacement of a HEPA filter bank, by verifying that the cleanup system satisfies the in-place penetration and bypass leakage testing criteria of less than 1% in accordance with ANSI N510-1975 for a DOP test aerosol while operating the cleanup system at a flow rate of 4000 cfm ± 10%; and

g. After each complete or partial replacement of a charcoal adsorber bank, by verifying that the cleanup system satisfies the in-place penetration and bypass leakage testing criteria of less than 1% in accordance with ANSI N510-1975 for a halogenated hydrocarbon refrigerant test gas while operating the cleanup system at a flow rate of 4000 cfm ± 10%.

are installed in the Main Control Room. The detectors are calibrated to detect 0.006 gcf (grams of products of combustion per cubic foot of air). Upon detection of smoke in the Main Con-trol Room, an alarm is sounded; the detectors do not affect operation of the ventilation system. For further information regarding the fire protection system, see Section 9.5.

The operator is responsible for taking appropriate action to extinguish a fire. If he is unable to do so, he may transfer control to the Auxiliary Control Room located in the Auxiliary Building adjacent to, but separate from, the Main Control Room. Safe Shutdown can be achieved and maintained from the backup control center even with the Main Control Room completely destroyed. (The design basis accident and the loss of main control room habitability are not assumed to occur simultaneously.) The backup control center is described in detail in Section 7.4.

6.4.3 System Operational Procedures

The MCRHS will operate in one of three modes to maintain the internal environmental conditions commensurate with outside conditions. The three operating modes are the normal mode, the emergency mode, and the extreme emergency mode.

Normal Mode

In the normal operations mode, all doors into the MCRHS area will be normally closed and will be used just for necessary ingress and egress. These doors are part of the plant security system and will have a card-operated electric lock system that will sound an audible alarm in the Main Control Room if any one of the doors fails to close. A printout is provided in the Main Control Room when the doors are opened. The operator in the Main Control Room will take corrective action to close the doors on receipt of an abnormal indication. 52

During normal operations, the control building pressurizing fans provide up to 3200 cfm of outside air to the MCRHS area. Since airflow is controlled in conjunction with air outflow from the Main Control Room and adjacent rooms, the pressure in this area will remain positive. A modulating damper is provided to keep the MCR pressure at about 1/8 inch of water above atmospheric while other rooms in the MCRHS area will be maintained at a slightly positive pressure above atmospheric. 52

Emergency Mode

The emergency operations mode is utilized for any condition requiring MCRHS isolation. Isolation of the MCRHS area occurs automatically upon the actuation of a safety injection signal from either reactor unit or upon indication of high radiation, high temperature, ~~chlorine,~~ or smoke concentrations in the outside air supply stream to the building. Isolation of the MCRHS area may also be accomplished manually at any time by the control

room operators.

Upon receipt of a signal for MCRHS isolation, the following conditions directly affecting the MCRHS will be automatically implemented:

1. Both control building emergency air cleanup fans will operate to recirculate a portion of the control room air-conditioning system return air through the cleanup trains composed of HEPA filters and charcoal adsorbers. One of the emergency air cleanup fans will subsequently be placed in the standby mode by the operator. 24 52

2. Both control building emergency pressurizing air supply fans will operate to supply a reduced stream of outside air to the main control room air-conditioning system to keep the MCRHS area pressurized, relative to the outdoors and other floors, thereby minimizing the inleakage of unprocessed or contaminated air. This fresh air is routed through the emergency air cleanup trains. One of the two emergency pressurizing fans (and its associated emergency air intake) will subsequently be placed in the standby mode by the operator. ~~A high chlorine signal does not initiate emergency pressurization.~~ 24 52

3. The exhaust fan in the toilet rooms will be stopped, and double isolation dampers will be closed to prevent the inflow of unfiltered outside air to the MCRHS area. 52

In addition, the following conditions which indirectly affect the MCRHS will be automatically implemented:

1. The spreading room supply and exhaust fans will be stopped and the operating battery room exhaust fan will continue to run.

2. Double isolation dampers in the spreading room supply duct and a single isolation damper in the exhaust duct will close to prevent infiltration of outside air to the spreading room.

3. The building normal pressurizing air supply fans will continue to operate to supply a reduced amount of outside air to the control building lower floors only.

In the emergency mode, determination of the appropriate emergency pressurizing fan to place in standby will be based on the operator's judgment. The fan associated with the emergency air 24

6.4.4 Design Evaluations

6.4.4.1 Radiological Protection

Refer to Chapter 15.

6.4.4.2 Toxic Gas Protection

The evaluation of Main Control Room habitability included consideration of possible hazards created by accidental release of potentially toxic chemicals. The evaluation considered chemicals stored both onsite and offsite within a 5-mile radius. Possible shipments of toxic chemicals by barge, rail, or road routes within a 5-mile radius were also considered. 45

Watts Bar Steam Plant, located approximately 0.7 miles from Watts Bar Nuclear Plant, is an ~~the only~~ offsite storage location for potentially hazardous chemicals within the 5-mile radius considered. Chemicals stored at the steam plant include acetone, anhydrous ammonia, carbon dioxide, methanol, nitrogen, sulfuric acid, isopropal alcohol, calcium oxide, bentonite, soda ash, salt (NaCl), sodium sulfite, dichlorodifluoromethane, feron, acetylene, and sodium hypochlorite. Only very small quantities of the chemicals, excluding carbon dioxide and nitrogen, are stored however. Approximately 1 ton of carbon dioxide and 5 tons of nitrogen are stored at the steam plant. Since nitrogen and carbon dioxide are asphyxiants and large concentrations of these chemicals are required to create a hazard, and since only small quantities, as defined in Table C-2 of NRC Regulatory Guide 1.78, of the other more toxic chemicals are stored, no hazard to Main Control Room personnel at Watts Bar Nuclear Plant is foreseen. 45 45

The only known shipments of potentially toxic chemicals transported past the site by road route are the small quantities of chemicals shipped to Watts Bar Steam Plant as discussed above. These are transported via State Route 68 which passes within 1 mile of Watts Bar Nuclear Plant. The frequency of shipment is less than the guideline value given in NRC Regulatory Guide 1.78 for all of the chemicals except carbon dioxide and nitrogen. The quantity of each shipment is small for all of the chemicals. Therefore, no hazard to Main Control Room personnel is expected.

The only rail line within a five-mile radius is the spur track which serves the plant itself. Any chemicals transported to the site were evaluated as stored on site. 45

Barge traffic passing the plant site includes shipments of fuel oil and asphalt-related products, refer to Section 2.2.2.2. Release of these commodities will not result in introduction of toxic gases to the MCRHS area. The shipments are not considered to pose a hazard to Main Control Room personnel unless smoke generated by a barge fire should be blown toward the control 25

The potable water plant located on State Route 68 approximately two miles from Watts Bar Nuclear Plant provides storage for five-150 pound cylinders of chlorine; however, analysis has shown that this small quantity is not a hazard to MCR operators.

building air intake. If this should occur, however, ionization type smoke detectors in the intakes will initiate MCRHS isolation and preclude entrance of combustion products into the MCRHS area. The sensitivity range of the detectors is 0.2 to 4.0 percent optical density per foot, as determined in accordance with UL Standard 167, 'Smoke Detectors, Combustion Products Type for Fire Protective Signaling Systems.' The small amount of smoke which could possibly enter the area prior to isolation will be quickly removed by the air cleanup units. Therefore, Main Control Room habitability will not be degraded by accidents involving these products. 25

Chemicals stored on site which are considered to be potentially hazardous to Main Control Room personnel include carbon dioxide, ~~chlorine,~~ ammonia hydroxide, hydrazine, sodium hypochlorite, hydrogen, nitrogen, argon, and acetylene. It was assumed that the remaining chemicals do not constitute a hazard to Main Control Room personnel due to the fact that they are stored in small quantities, solids or liquids with a very low vapor pressure at ambient temperatures.

Analyses were performed for the potentially hazardous chemical utilizing the approach outlined in NRC Regulatory Guide 1.78, 'Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During A Postulated Hazardous Chemical Release.' Major assumptions included pasquill stability class G and adverse wind direction. Wind speed was chosen to maximize the 2-minute concentration at the control building intakes. 49

A 24-ton capacity carbon dioxide tank is located in the carbon dioxide storage building approximately 40 feet from the east end of the control building. Two methods of analysis indicated that upon a carbon dioxide release, maximum concentraTions in the main control room would be 14,830 mg/m³ and 0.012 percent by volume, both below the toxicity limit listed in Regulatory Guide 1.78.

~~Chlorine is stored in a 1,125 ft³ cylinder. Analysis indicated that a ground level release of the chlorine directly below the main control room air intakes would cause a maximum concentration of only 3.06 x 10⁻¹⁴ mg/m³ in the room, well below the toxicity limit.~~

Ammonia hydroxide and hydrazine are stored in the turbine building in 600 gallon and 250 gallon capacity tanks, respectively. Analyses indicated that upon a spill of either of these tanks, most of the liquid would drain into the turbine building sump and any vapors given off would be dispersed by the turbine building ventilation system.

Sodium hypochlorite is stored as an 8 percent solution in the sodium hypochlorite building. The solution has a pH of 11 at this concentration. In order for chlorine to form upon a spill, the pH would have to be lowered to about a pH of 4. Since no acidic solutions would be present to cause this reduction in pH, it was assumed that no chlorine would be given off, any liquid would be contained within the sodium hypochlorite building, and any vapors would be dispersed by the building ventilation system.

Hydrogen is stored in 80,000 ft^3 tanks at the hydrogen tailers. Analyses indicated that upon a release, calm wind conditions would allow the hydrogen to rise into the atmosphere before reaching the air intakes and stronger winds would disperse the hydrogen into a harmless concentration. 49

Nitrogen, argon, and acetylene are asphyxiants and are stored in 11,250 ft^3 cylinders. Analyses indicated that this quantity of an asphyxiant, if released into the Main Control Room directly, would not reduce the oxygen concentration below a safe level.

Ittwas therefore concluded that no hazard to control room habitability is posed by any of the chemicals stored on site, offsite within a 5-mile radius, or transported by the site by barge, rail, or road within a 5-mile radius. ~~Chlorine detectors are, however, provided in the control building air intake as a precautionary measure per Regulatory Guide 1.95.~~

6.4.5 Testing and Inspection

Tests and inspections conducted on the Main Control Room Habitability System are mainly concerned with the HVACAC System, the capability to keep a positive pressure within the MCRHS area, and the operation of the airborne hazards monitors. The scope includes preoperational and periodic tests. The preoperational tests objectives are to demonstrate that the HVACAC System, the MCRHS enclosure, and the airborne hazards monitors are capable of detecting hazards and are capable of establishing and maintaining acceptable conditions for safe, long-term occupancy. In this testing, the capability for performing all necessary functions is verified. The periodic tests are scheduled to be performed during the plant lifetime in accordance with the Technical Specifications. 52

Standard testing methods are employed for these tests. System functional testing is accomplished by simulating signals to specific HVACAC controls and observing and/or measuring the response. Flow, thermal, and humidity tests are accomplished with instrumentation accurate to at least +5 percent. Additional details are given in Sections 9.4.1.4 and 6.5.1.4.4.

The acceptance standards set for this testing specify that the equipment must demonstrate a capability to perform at or close to

rated levels. Appropriate corrective measures needed to comply with the Technical Specifications are planned for all test failures and shortcomings.

6.4.6 Instrumentation Requirements

Several kinds of instrumentation are utilized in the MCRHS. Beta radiation sensors, temperature sensors, ~~chlorine sensors~~ and smoke monitors are installed in the makeup air intake duct to detect harmful concentrations of these airborne hazards. Thermostats and humidistats are positioned in the Main Control Room to control HVACAC System operations. Static pressure differential sensors are installed in the air cleanup units to measure the pressure change across each air purification element bank. Temperature sensors are utilized for duct heater element control to keep the incoming air above specified limits. Flow sensors are installed downstream from each main control room air handling unit to sense the presence of substandard air flows and initiate startup of the standby redundant HVACAC train. 45

Instrumentation details of the Control Room HVAC system is provided in Section 9.4.1. General descriptions of safety related plant instrumentation is provided in Chapter 7. The detailed instrumentation drawings of the Control Room HVAC System have been incorporated into the FSAR by reference in Table 1.7-1. 28

9.4.1 Control Room Area Ventilation System

9.4.1.1 Design Bases

The control building heating, ventilating, air-conditioning, and air cleanup systems are designed to maintain the temperature and humidity conditions throughout the building for the protection, operation, and maintenance and testing of plant controls; and for the safe, uninterrupted occupancy of the main control room habitability system (MCRHS) area during an accident and the subsequent recovery period. Refer to Section 6.4 for further information regarding control room habitability and definition of MCRHS area. The building pressurizing air supply system is designed to maintain the Control Building, except the spreeding room, at a positive pressure relative to the outdoors and to the adjoining buildings at all times to minimize air inleakage. 52

The control building air-conditioned spaces are maintained at approximately 75°F and 50 percent relative humidity for the protection of instruments and for the comfort and safety of the operators. These conditions are continuously maintained during all modes of normal and accident operation, even with outdoor conditions of 97°F dry bulb (DB) and 78°F wet bulb (WB) in summer or 15°F DB in winter.

During normal plant operation, a continuous stream of fresh air is mechanically supplied to the building to replace that exhausted plus makeup for outleakage thereby maintaining the building at a slight positive pressure relative to the outdoor pressure to minimize air inleakage.

The control building outside air intakes are provided with radiation monitors, ~~chlorine detectors,~~ high temperature detectors and smoke detectors. Indicators are provided with the ~~high temperature detectors,~~ radiation monitors. Main Control Room annunciation is provided for each type of monitor or detector. Isolation of the MCRHS area occurs automatically upon the actuation of a safety injection signal from either unit or upon indication of high radiation, high temperature, ~~chlorine,~~ or smoke concentrations in the outside air supply stream to the building. 52

Upon receipt of a signal for MCRHS area isolation, the following conditions will be automatically implemented: 52

1. The control building emergency air cleanup fans will operate to recirculate a portion of the MCRHS area air-conditioning system return air through the cleanup trains composed of HEPA filters and charcoal adsorbers.

2. The control building emergency pressurizing air supply fans will operate to supply a reduced stream of outside air to the main control room air-conditioning system to keep the MCRHS area pressurized, relative to the outdoors and other floors, thereby minimizing the inleakage of unprocessed or contaminated air. This fresh air is routed through the emergency air cleanup trains. ~~A high chlorine signal does not initiate emergency pressurization.~~ 52

3. The building normal pressurizing air supply fans will continue to operate to supply a reduced amount of outside air to the control building lower floors only.

4. The exhaust fan in the toilet rooms will be stopped, and double isolation dampers will be closed to prevent the inflow of unfiltered outside air to the control room.

5. The spreading room supply and exhaust fans will be stopped and the operating battery room exhaust fan will continue to run. 52

6. Double isolation dampers in the spreading room supply duct and a single isolation damper in the exhaust duct will close to prevent infiltration of outside air to the spreading room.

MCHRS area isolation may be accomplished manually at any time by the control room operators. 52

The following building air-conditioning and ventilating system components are each provided with two 100 percent capacity units. Each meets the single failure criterion, and automatic switchover is assured if one of the units fails. These systems include the:

1. Main control room air-conditioning system, water chillers, air handling units, and piping.

2. Control building pressurizing air supply fans.

3. Control building emergency air cleanup supply fans and filter assemblies.

4. Control building emergency pressurizing air supply fans. 52

The electrical board room air conditioning system is provided with two 100 percent capacity package water chillers and four 50 percent capacity air handling units with associated piping, valves, and controls. This system meets the single failure criterion, and automatic switchover is assured if one of the components fails.

is automatically controlled as required to maintain approximately 1/8-inch positive static pressure in the main control room and a slight positive pressure in the remainder of the building, except the spreading room which is at a slight negative pressure relative to outdoors. Adjustable inlet vanes for each air supply vaneaxial fan are automatically controlled by the differential pressure controller. 52 44

During accident conditions, double isolation dampers automatically close to terminate the supply of fresh air to the Main Control Room and spreading room floors, and the operating pressurizing fans adjustable vanes are automatically positioned to supply a reduced quantity of fresh air to the lower floors. These rooms are supplied with approximately 3000 cfm or the amount required to replace the air exhausted from the battery rooms and to maintain these rooms at a slight positive pressure relative to the outdoors. 52

The building pressurizing supply fans are the vaneaxial type, each rated for 8200 cfm against 0.75 inch water gauge static pressure and each direct driven by a 15-hp motor. These fans are energized from the emergency power system upon loss of offsite power.

The Control Building emergency air cleanup system is located within the mechanical equipment room at El 755. This system is provided with two 100 percent capacity emergency air cleanup fans, each rated at 4000 cfm, and two 100 percent capacity air cleanup filter assemblies arranged in two parallel 100 percent capacity fan-filter trains. Each air cleanup filter assembly consists of a bank of HEPA filters followed by a bank of charcoal adsorbers enclosed within a plenum. Refer to Section 6.5 for further information related to the emergency air cleanup units. 52

The Emergency Air Cleanup System automatically operates upon an accident signal or upon indication of high radiation, high temperature, ~~chlorine,~~ or smoke concentrations in the building fresh air supply. This system can also be manually started from the main control room at any time. During an accident, both of the emergency air cleanup supply fans are started. Controls are provided to permit the control room operators to shut down either one of the air cleanup units and to keep it as a backup. The backup unit automatically starts in the event the operating cleanup unit fails.

During air cleanup system operation, a portion of the control room air conditioning system return air is continuously routed through one or both of the air cleanup units and then to the system return air plenum. The cleaned air is thus recirculated

Upon receipt of an accident signal, both emergency pressurizing fans are started by the same accident signal that starts the air cleanup units. ~~(emergency pressurization is not initiated upon a high chlorine signal)~~. The capability is provided to place either of the operating air cleanup units and either of the operating emergency pressurizing fans in the standby mode. The standby components start automatically in the event of a failure of the operating air cleanup unit or its pressurizing fan.

During control room isolation, the building normal air pressurizing supply system fan will continue to operate to supply fresh air to the electrical board rooms air-conditioning system. Double isolation dampers, mounted in the normal air pressurizing supply duct to the Main Control Room air-conditioning system and spreading room supply duct will automatically close to prevent the leakage of unfiltered outdoor air to the control room. 24

The battery rooms ventilation system consists of three 100 percent capacity exhaust fans, with two on standby, discharging approximately 2200 cfm of battery room air to the outdoors. The fans are located on the El 692 floor with two located near the west end of the building and one located near the east end.

Air to replace that exhausted from each battery room is taken from the electric board rooms air-conditioning system return air. Fire dampers, provided in each room's air exhaust duct and air supply opening, operate to isolate the room upon high temperature.

The battery room exhaust fans are the centrifugal type, each rated at 2200 cfm against 1.25-inch water gauge static pressure and each direct driven by a 1.5-hp motor.

The battery rooms ventilation system is required to operate at all times except during the design basis flood and a standby fan will automatically start upon failure of the operating fan to produce airflow. These fans are ESF equipment and are connected to the emergency power system.

The spreading room is ventilated by two spreading room exhaust fans located at the east end of the spreading room at El 729. These 50 percent capacity fans each exhaust approximately 2000 cfm of air to the outdoors for a total of 4000 cfm. One spreading room supply fan, located in the mechanical equipment room at El 755, supplies approximately 1200 cfm of air from the control room air- conditioning return air system. An additional 2000 cfm of air is supplied by the pressurizing supply fans. The room is thus maintained at a slight negative pressure and approximately 800 cfm enters the spreading room via leakage from the adjoining rooms. 52

the duct heater in the control building air supply duct. This equipment is located in the mechanical equipment room at floor El. 755 of the Control Building and is consequently unaffected by the design bassis flood. The water chillers serving the main control room air handling units are located inthe Auxiliary Building at floor El. 737 and are functional for floods up to the design basis flood level. Refer to Section 2.4.14 for additional discussion of the plant flood protection plan. 35

9.4.1.4 Tests and Inspection

The control building air-conditioning systems are in continuous operation and are accessible for periodic inspection. Essential electrical components, switchovers, and starting controls are tested initially and periodically. The building pressurizing air supply system is in continuous operation, and the fans are accessible for periodic inspection.

The building emergency pressurizing air supply fans and air cleanup assemblies are tested periodically. Details of the testing program for the air cleanup units are included in Section 6.5.

Radiation monitors are calibrated and tested periodically using a calibrated check source to verify the instruments' response and alarm functions. Thermostats and smoke detectors~~, and chlorine detectors~~ are tested periodically.

The battery rooms ventilating system is in continuous operation. The exhaust fans are accessible for periodic inspection.

The air-conditioning system filter cells shall have their filtering media replaced upon a resistance buildup to 1-inch water gauge static pressure differential.

9.4.2 Fuel Handling Area Ventilation System

9.4.2.1 Design Bases

The fuel handling area ventilation system, a subsystem of the Auxiliary Building Ventilating System, serves the fuel-handling area at El 757, the penetration rooms at El 757 and El 782, and the fuel, waste, and cask handling areas at El 729 and El 692.

The system is designed to: (1) maintain acceptable environmental conditions for personnel access, operation, inspection, maintenance, and testing, (2) protect mechanical and electrical equipment and controls, and (3) limit the release of radioactivity to the environment during all weather conditions. The environmental control system is designed to maintain building