Southern Baptist Disaster Relief

Earthquake Awareness Manual

Disaster Relief Office, South Carolina Baptist Convention

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I. SOUTH CAROLINA'S STATE PLAN WITH THREE COMPONENTS

A. **Basic Plan** contains responsibilities, operational concepts, functional task assignments, and planning scenario.

B. **Individual Annexes** utilize the Emergency Support Function (ESF) concept for each of the major response functions/activities. Annexes describe the hazard-specific concept of operations, actions, and responsibilities that pertain to the function being covered.

C. **Earthquake Specific** provides specific planning guidance for earthquake response actions.

II. SITUATION AND ASSUMPTIONS

A. Situation

1. An earthquake is a sudden, rapid shaking or trembling of the earth's surface, and could be highly destructive. It will occur without warning, and a strong earthquake will cause severe damage and a large number of casualties over a wide area. Aftershocks may occur for some period of time, but will diminish gradually over the course of time.

2. There are two methods of measuring earthquakes: intensity and magnitude.

   a. Intensity is measured by the Modified Mercalli Intensity (MMI) Scale that is a subjective measure of damage based on the observed effects of the earthquake. The scale categorizes intensity from I (Micro) to XII (Rate Great). The Charleston Earthquake of 1886 MMI is estimated at Intensity X.

   b. Magnitude (M) is a measure of an earthquake's size. Most earthquakes M less than 3.9 would not cause any significant damage, and may only be felt by a few people in the area of occurrence. An M 6.0 earthquake is typically the threshold for causing serious damage. Earthquake magnitude (M) classifications are:

      - Great = M > 8.0+
      - Major = M 7.0 to 7.9
      - Strong = M 6.0 to 6.9
      - Moderate = M 5.0 to 5.9
      - Light = M 4.0 to 4.9
      - Minor = M 3.0 to 3.9
      - Micro = M < 3.0

3. Most earthquakes occur along faults or breaks between massive continental oceanic/tectonic plates that collide, slide, or separate, creating earthquakes. South Carolina, however, is located in the middle of the North American tectonic plate. Consequently, earthquakes occur less frequently, but more violently, over a much greater area due to sub-surface geological conditions.

4. Although a great earthquake has not occurred in South Carolina since 1886, there is as great a potential of a magnitude 6 or higher earthquake to kill people and cause damage in the State as there is in California. South Carolina experiences several earthquakes annually. These are typically low-level events with magnitudes ranging from less than 1.0 to approximately 3.0 but generally not felt by people. About 70 percent of these occur in the vicinity of the epicenter of the 1886 Charleston earthquake in a region referred to as the Middleton Place-Summerville Seismic Zone (MPSSZ).

5. South Carolina has experienced much stronger and damaging earthquakes in the past. Two significant earthquakes in the State include the 1886 Charleston earthquake (estimated at M 7.3) and the 1913 Union County earthquake (estimated at M 4.5). The 1886 Charleston earthquake was the most damaging earthquake to occur in the Eastern United States.
6. A great earthquake occurring anywhere in the State would result in immediate activation of the State Emergency Operations Center (SEOC) and the State Emergency Response Team (SERT). However, the most probable location for a great earthquake event would be Charleston, South Carolina with a similar M 7.3.
7. Facts about the 1886 Charleston, South Carolina, Earthquake:
    a. Occurred August 31, 1886. The main shock was followed by an aftershock two minutes later, and many more shocks were felt over the next three years.
    b. Time: 9:51 p.m. Eastern Standard Time
    c. M = 7.3
    d. Intensity on Modified Mercalli Scale = X
    e. Two epicenters were reported:
        - Woodstock, a railroad stop on the Southern Railway leading into Charleston located 21 miles northwest of Charleston.
        - Ravenel, a small town 23 miles southwest of Charleston.
    f. Felt over 2.5 million square miles (from Cuba to New York and Bermuda to the Mississippi).
    g. Approximately 60 persons lost their lives.
    h. Ninety percent of the brick structures in Charleston were damaged. (Today that would equate to approx. 24 million tons of debris.)
    i. Damaging secondary effects were fires, ruptured water and sewage lines, damaged wells, and flooding from a cracked dam in Langley, South Carolina.
    j. Dollar damage estimates in 1886 dollars were about $5.5 million. (In today's dollars, that would equal approximately $900 million.)

B. Modified Mercalli Intensity Scale

I. People do not feel any Earth movement.

II. A few people may notice movement.

III. Many people indoors feel movement. Hanging objects swing.

IV. Most people indoors feel movement. Dishes, windows, and doors rattle. Walls and frames of structures creak. Liquids in open vessels are slightly disturbed. Parked cars rock.

V. Almost everyone feels movement. Most people are awakened. Doors swing open or close. Dishes are broken. Pictures on the wall move. In some cases windows crack. Small objects move or are turned over. Liquids may spill out of open containers.

VI. Everyone feels movement. Poorly built buildings are damaged slightly. Considerable quantities of dishes and glassware, and some windows are broken. People are having trouble walking. Pictures fall off walls. Objects fall from shelves. Plaster in walls my crack. Some furniture is overturned. Small bells in churches, chapels, and schools ring.

VII. People have difficulty standing. Considerable damage occurs in poorly built or badly designed buildings, old walls, spires, and other structures. Damage is slight to moderate in well-built buildings. Numerous windows are broken. Weak chimneys break at roof lines. Cornices on towers and high buildings fall. Loose bricks fall from buildings. Heavy furniture is overturned and damaged. Some sand-and-gravel streams banks cave.

VIII. Drivers have trouble steering. Poorly built structures suffer severe damage. Ordinary substantial buildings partially collapse. Damage is slight in structures especially built to withstand earthquakes. Tree branches break. Houses not bolted down may shift on their foundations. Tall structures such as towers and chimneys may twist and fall. Temporary or permanent changes may occur in springs and wells; sand and mud are ejected in small amounts.

IX. Most buildings suffer damage. Houses that are not bolted down move off their foundations. Some underground pipes are broken. The ground cracks conspicuously. Reservoirs suffer severe damage.

X. Well-built wooden structures are severely damaged and some destroyed. Most masonry and frame structures are destroyed, including their foundations. Some bridges are destroyed. Dams are seriously damaged. Large landslides occur. Water is thrown on the banks of canals, rivers, and lakes. Railroad tracks are bent slightly. Cracks are opened in cement pavements and asphalt road surfaces.

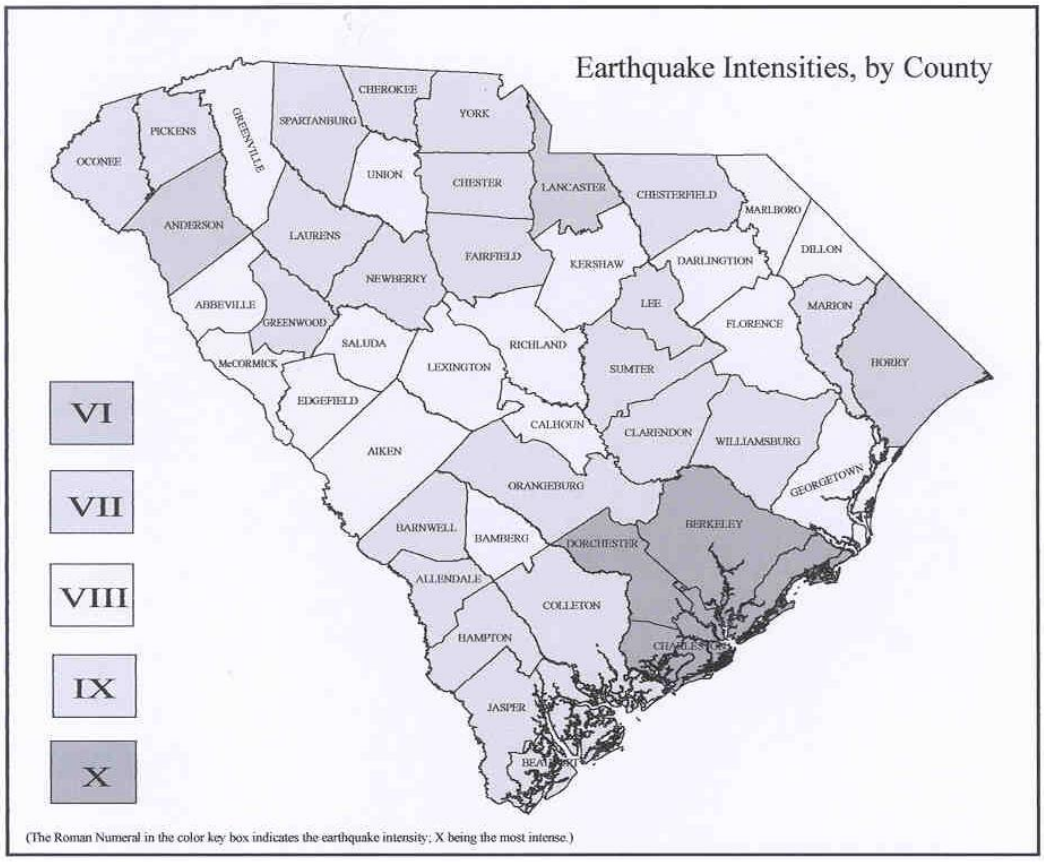
XI. Few, if any, masonry structures remain standing. Large, well-built bridges are destroyed. Wood-frame structures are severely damaged, especially near the epicenter. Buried pipelines are rendered useless. Railroads tracks are badly bent. Water, mixed with sand and mud, is ejected in large amounts.

XII. Damage is total, and nearly all works of construction are damaged greatly or destroyed. Objects are thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move. Lakes are dammed, waterfalls formed, and rivers are deflected.

Modified from Projected Earthquake Intensities for South Carolina
By Clark A. Niewendorp, SCGS Open File Report #111, 1998

C. Projected Earthquake Intensities for South Carolina

PROJECTED EARTHQUAKE INTENSITIES FOR SOUTH CAROLINA

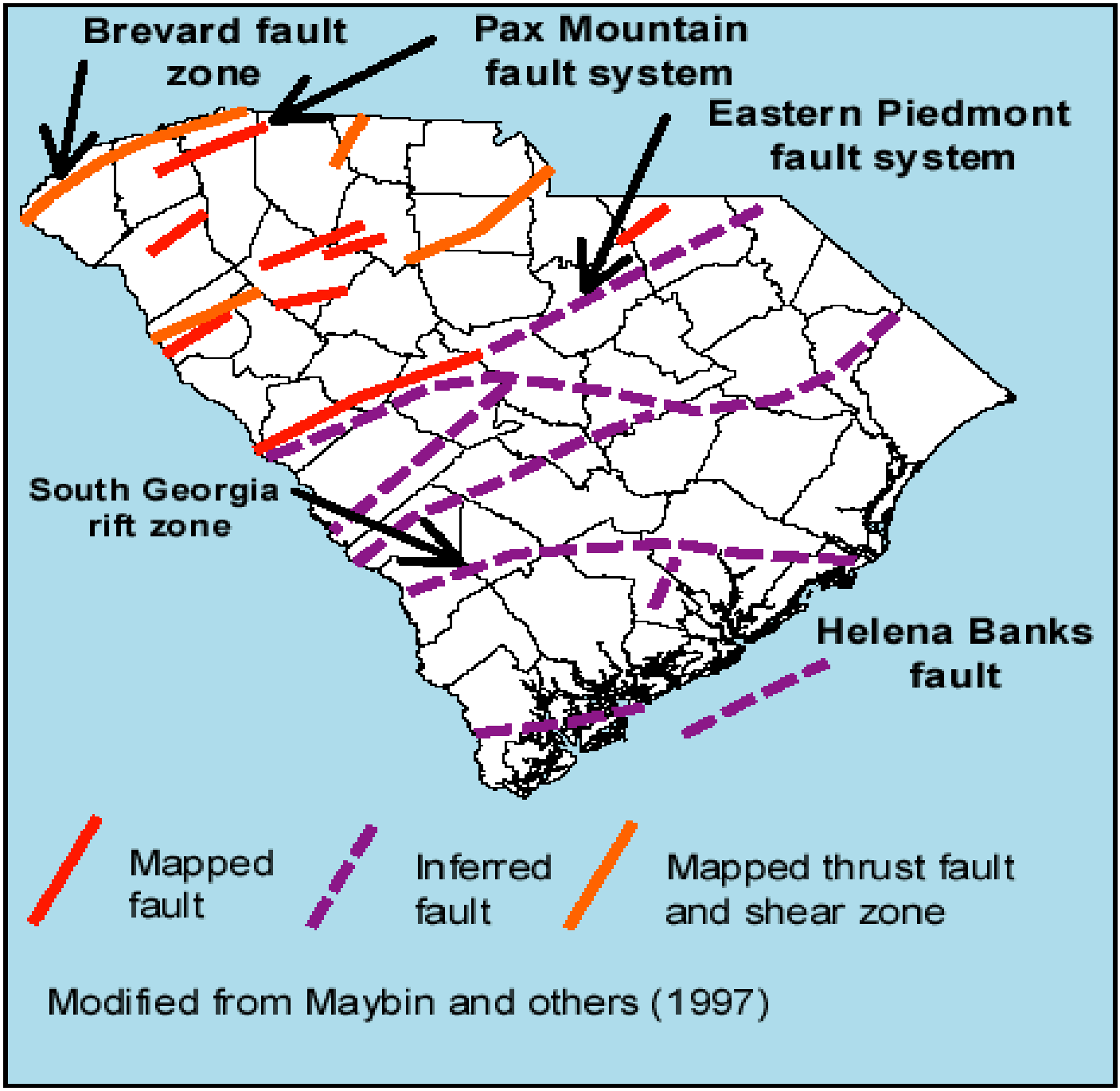


(The Roman Numeral in the color key box indicates the earthquake intensity; X being the most intense.)

This map shows earthquake intensities, by county, based on the Modified Mercalli Intensity Scale. Intensity is a numerical index describing the effects of an earthquake on the surface of the Earth, on man, and on structures built by man. The intensities shown on this map are the highest likely under the most adverse geologic conditions that would be produced by a combination of the August 31, 1886, Charleston, S.C., earthquake and the January 1, 1913, Union County, S.C., earthquake. There will actually be a range of intensities within any small area such as a town or county, with the highest intensity generally occurring at only a few sites. The Rossi-Forel Scale initially used to describe the January 1, 1913, Union County, S.C., earthquake is considered comparable to the Modified Mercalli Intensity Scale for the purpose of developing this map.

South Carolina Geological Survey
Educational Series #7a

D. South Carolina Fault Map



E. Assumptions

1. The Governor will declare a State of Emergency and request a Presidential Declaration.

2. An earthquake of M 6.0 or greater could quickly exceed state and local resources. It is anticipated that a significant amount of external resources will be required for a disaster response.

3. South Carolina will immediately request support from FEMA.

4. FEMA will activate the National Response Plan (NRP).

5. Damaged transportation roads may not be functional for many weeks or months.

6. Damage to transportation, communication, and other infrastructure systems will isolate communities, creating virtual islands within the disaster areas. For at least 72 hours after an earthquake, affected local governments and individuals will be attempting to meet their own emergency needs.

7. Significant aid from state and federal governments to local governments may not be available for 72 hours.

8. South Carolina Emergency Management Division (SCEMD) will activate the Statewide Mutual Aid Agreement, Emergency Management Assistance Compact (EMAC), and established mutual aid agreements will be honored to the extent possible.

9. Shelters identified for use during other natural disasters may not be available in the impacted area. Sheltering may take place outside the impacted area.

10. State Emergency Response Team (SERT) will report to the State Emergency Operations Center (SEOC), and the State Assessment Team (SAT) may be deployed.

11. The SEOC and county emergency managers in the damaged areas may need to establish alternate Emergency Operations Centers (EOC) due to possible structural damage to the primary EOC.

12. The SC Logistical Operations Plan will be implemented.

13. Tourist populations and business conventions and/or conferences will be in attendance in the State.

F. Earthquake Planning Scenario

1. The scenario earthquake used in this Plan is forecast as a possible worst case. It is a magnitude 7.3, similar to the 1886 Summerville/ Charleston earthquake that impacted the entire State. The accepted magnitude of the 1886 earthquake is M 7.3, and was intensity X on the Modified Mercalli Scale. This earthquake remains the most severe earthquake to hit the Eastern seaboard.

2. A magnitude 7.3 earthquake occurring at the epicenter of the Charleston 1886 earthquake would affect the entire State, with most of the destruction and damage occurring within a 100+ mile radius from the epicenter, with Berkeley, Charleston, and Dorchester counties to experience the greatest impact. Most buildings, including schools, hospitals, and fire stations will suffer at least moderate damage. Moderate damage is defined as a facility or infrastructure requiring inspection prior to reuse.

3. The results presented in the SC Comprehensive Seismic Risk and Vulnerability Study indicate that an M 7.3 Charleston scenario earthquake would be by far the most destructive and disruptive event to the state. There will be widespread damage to all critical lifeline systems in the Tri-county region. Particularly hard hit will be electric power facilities, water and wastewater systems and communications systems. The damage will likely result in disruption of utility services for periods ranging from a few days to months after the earthquake. Specific results from the M 7.3 statewide scenario include:

    a. A daytime event will cause the highest number of casualties. Of the total estimated *20,000 casualties statewide (in which *19,000 in Charleston, Berkeley, and Dorchester counties), approximately 70% will be injuries requiring medical attention, 24% will require hospitalization, and 6% will be fatalities.

    b. Approximately *17,000 people statewide will seek temporary public shelter (*15,000 in Charleston, Berkeley, and Dorchester counties). These numbers could rise in the weeks following the earthquake as weakened structures continue to fail.

    c. Approximately *458,000 persons in the Charleston, Berkeley, and Dorchester counties will need to be fed two meals a day, this includes emergency workers and persons who sheltered in place. (See Operational Area Loss Estimation Attachment to the Basic Plan.)

    d. Over 400 schools (K-12) total will experience at least moderate damage.

    e. Approximately 100 fire stations statewide will experience at least moderate damage.

    f. Approximately 11 million tons of debris will be generated in Charleston, Berkeley, and Dorchester counties.

g. Of the 108 hospitals statewide, 12 will experience at least moderate damage greater than 50%, with most of the damaged hospitals located in Charleston, Dorchester, and Berkeley counties.

h. Approximately 100 fires will be ignited statewide.

i. Approximately 500 bridges statewide are expected to suffer structural damage, rendering many of them unusable.

j. A significant portion of the Berkeley, Charleston, and Dorchester areas are susceptible to liquefaction. However, ground failure effects contribute about 5% or less to losses.

k. Electric power facilities will suffer damage and approximately *84,000 households in Charleston, Berkeley, and Dorchester counties) will be without power day one following the earthquake.

l. Day one following the event, approximately *160,000 households statewide will be deprived of water. It could take weeks, possibly months, to fully restore the water systems.

m. Approximately 60% of the displaced households will have pets requiring medical care and sheltering. In addition, a large number of horses and livestock will be affected, both by injury and by food/water deprivation.

n. The affected counties can expect animal carcasses for disposal and follow-up care of remaining live animals for disease prevention and public health concerns.

See Operational Area Loss Estimation attachment.

*NOTE: The population data updated to 2007 projected US Census estimates.

III. RESPONSE PRIORITIES

A. To establish an orderly and manageable system of resource allocation and response actions, SERT Executive Group will be responsible for determining the priorities of effort and allocating resources to operations. Decisions about the allocation of incoming resources and response will be made on the basis of the highest priority lifesaving needs.

B. SERT Operations Group will thoroughly assess the situation before forwarding its recommendations on response priorities and resource allocation to the SERT Executive Group.

C. Because state-level resources may rapidly be exhausted, SEOC Operations will request assistance from FEMA and other states through EMAC as required. See Critical Resource Needs Assessment, Tab G to Annex 20.

D. Forecasts and projections will be developed to cover future resource allocations based on estimated priorities and resource needs projections as established by the SERT Executive Group.

E. SERT members will ensure that response activities within their respective areas are coordinated between the various ESFs and SERT Operations Group, and that they are in concert with the priorities and policies established by the SERT Executive Group. Decisions with regard to the allocation of limited resources shall be coordinated and accomplished according to SERT Executive Group decisions.

F. Lifesaving operations will be the first priority. After immediate lifesaving needs have been met, the recommended response priorities in support of lifesaving operations within the first 72 hours are:

NOTE: Many of these actions will take place simultaneously.

1. Communication - Establishing centralized communication to coordinate rescue and response efforts and to determine extent of damage.

2. Transportation - Assessing transportation roads and bridges to determine structural safety to transport resources and victims to medical facilities in the damaged areas.

3. Search and Rescue Operations - Search and rescue of victims trapped in collapsed structures and administering first aid.

4. Health and Medical - Providing medical care and assisting in transporting the seriously injured to triage or functioning medical facilities.

5. Firefighting - Directing firefighting efforts to the most essential facilities and control of the spread of fires.

6. Law Enforcement - Providing for the public safety of citizens.

7. Basic Human Needs/Mass Care - Providing basic mass care (food, water, and shelter).

8. Hazardous Materials - Inspecting and evaluating the level of HAZMAT release and the impact on the public.

9. Preliminary Damage Assessment - Conducting preliminary damage assessment of critical facilities.

10. Public Information - Providing accurate, consistent, and expedient emergency information to the public.

IV. INITIAL RESPONSE

A. What to expect:

1. Fatalities and injuries
2. Smell
3. Infrastructure
4. Fire and police protection
5. Radio, television, phone and cell phones
6. Road conditions
7. Time of day the earthquake occurred

B. Safety DOs

1. General
   a) Try to remain calm.
   b) Stay off the telephone
   c) Put on sturdy shoes or boots to protect your feet from debris and provide ankle support.
   d) Store water in a bathtub or large container and sterilize water that wasn't bottled before using it.
   e) If you smell gas or hear a blowing or hissing noise, open a window and quickly leave the building. Turn off the gas, using the outside main valve if you can, and call the gas company. If you turn off the gas for any reason, a professional must turn it back on.
   f) Clean up broken glass, medicines, and flammable liquids.
   g) Take a few moments to rest every hour or so, and consider what you're going to do next.
2. At Home
   a) Check on your family members. Make sure you know where each member is and their condition. Apply any needed first aid you can until help arrives.
   b) Use a fire extinguisher to put out small fires. Don't use water on electrical or gas fires. If you can't put the fire out quickly, get everyone out of the area right away.
   c) If you smell gas or hear a blowing or hissing noise, open a window and quickly leave the building. Turn off gas, using the outside main valve if you can, and call the gas company. If you turn off the gas for any reason, a professional must turn it back on.
   d) Inspect your home's foundation, walls, and chimneys. Look and listen for any signs of possible collapse.
   e) If you are safe where you are, your best bet is to stay there.
   f) Discuss any first aid and safety tips you know of with others.
   g) Offer help to the people around you, your family, neighbors, and co-workers.

h) Isolate flammable liquids and other hazardous materials as much as possible without risking yourself.

i) Check your surroundings for fire, and remove any materials that may cause them to spread.

j) If you must move from where you are now, leave a note on the front door to tell family and emergency workers where you have gone,.

k) If you are at home and there is no immediate sign of collapse, fire, or gas leaks, it is time to take a closer look at your utility connections

l) Turn off any appliance that was on when the earthquake hit and check it for damage.

m) Check your water heater. If it fell over in the earthquake, it may have broken a gas, electric, or water line.

n) Retro fit any pictures, bookcases and other items/furniture that may cause a hazard if such objects fall.

3. Stay Clear of Unstable Structures

   a) If it is safe where you are right now, you are encouraged to remain there. Do not go outside unless the building you are in is unstable.

   b) If the shaking starts again, take cover under a sturdy piece of furniture or by an inside wall away from windows and top-heavy objects. You should keep your head and neck covered with your arms until the shaking stops.

   c) If you are outdoors when an aftershock begins, stay in the open away from buildings, signs, and overhead wires.

   d) Officials are assessing the situation to determine the extent of damage, and if the danger has passed. Residents are encouraged to remain calm and offer assistance to neighbors until help arrives.

4. On the Road

   a) It is best to stay off the roads right now, but if you must drive and the shaking starts again, pull over and stop in the first safe place you can find away from overpasses, power lines, and overhanging signs.

   b) Once you stop, stay inside your car.

   c) If you're on a bridge or an overpass, keep moving – CAREFULLY – until you are off the bridge, then look for a safe place to stop until the shaking is over.

5. Restrict Telephone Use

   a) The police and fire department know about the earthquake and are responding to the most serious problems first. Please try NOT to use the telephone, including you cell phone, unless you are reporting a life-threatening injury or a fire.

b) Unnecessary calls to report the earthquake or to report minor damage could keep life-saving calls from getting through. It is important to locate your friends and family members, but it may be best to wait until the initial confusion has passed.

6. Food
   a) If your power is out, eat the perishable foods and other food in your refrigerator first, then the food from your freezer. You should consider keeping canned goods and nonperishable foods until others stocks are consumed.
   b) Unless you are sure your gas and electric connections are safe, cooking outside on a propane grill, a charcoal grill, or a camping stove is advised. Remember that those are only for use outdoors.
7. Water Storage
   a) Fill your bathtub and any other large clean containers you have on hand.
   b) If your water heater is undamaged, the water inside it will be useful for drinking and cooking.
   c) If the water in the storage tank of your toilet is clear, you may be able to use that, as well, but you should not use water from the bowl.
   d) Plan on sterilizing any water that is not already bottled. Sterilize water by boiling it for five minutes or by adding three or four drops of liquid chlorine laundry bleach per quart and letting the mixture stand for half an hour.

C. Safety DON'Ts

1. Do not use matches, lighters, or candles until you are sure there are no gas leaks.
2. Do not use the telephone unless you are calling emergency services.
3. Do not waste water.
4. Do not go sightseeing, you could risk injury or interfere with emergency workers.
5. Do not forget that strong aftershocks are possible at any time.
6. If you think there might be a gas leak, do not switch lights on or off. If you need more light, use a flashlight instead of matches, lighters, or candles. A spark or open flame could start a fire or cause an explosion.

V. Choosing FIRE EXTINGUISHERS

Identify the type of materials in the area.

Class A: SOLIDS such as paper, wood, plastic, etc.

Class B: FLAMMABLE LIQUIDS such as paraffin, petrol, oil, etc.

Class C: FLAMMABLE GASES such as propane, butane, methane, etc.

Class D: METALS such as aluminum, magnesium, titanium, etc.

Class E: Fires involving ELECTRICAL APPARATUS

Class F: Cooking OIL & FAT, etc.

Types of fire extinguishers

With so many fire extinguishers to choose from, selecting the proper one for your home can be a daunting task. Everyone should have at least one fire extinguisher at home, but it's just as important to ensure you have the proper type of fire extinguisher. Fire protection experts recommend one for the kitchen, the garage and workshop.

Fire extinguishers are divided into four categories, based on different types of fires. Each fire extinguisher also has a numerical rating that serves as a guide for the amount of fire the extinguisher can handle. The higher the number, the more fire-fighting power. The following is a quick guide to help choose the right type of extinguisher.

- **Class A** extinguishers are for ordinary combustible materials such as paper, wood, cardboard, and most plastics. The numerical rating on these types of extinguishers indicates the amount of water it holds and the amount of fire it can extinguish.
- **Class B** fires involve flammable or combustible liquids such as gasoline, kerosene, grease, and oil. The numerical rating for Class B extinguishers indicates the approximate number of square feet of fire it can extinguish.
- **Class C** fires involve electrical equipment, such as appliances, wiring, circuit breakers, and outlets. Never use water to extinguish Class C fires - the risk of electrical shock is far too great! Class C extinguishers do not have a numerical rating. The C classification means the extinguishing agent is non-conductive.
- **Class D** fire extinguishers are commonly found in a chemical laboratory. They are for fires that involve combustible metals, such as magnesium, titanium, potassium, and sodium. These types of extinguishers also have no numerical rating, nor are they given a multi-purpose rating - they are designed for Class D fires only.

Some fires may involve a combination of these classifications. Your fire extinguishers should have ABC ratings on them.

Here are the **most common types of fire extinguishers:**

- **Water extinguishers** or APW extinguishers (air-pressurized water) are suitable for Class A fires only. Never use a water extinguisher on grease fires, electrical fires, or class D fires - the flames will spread and make the fire bigger! Water extinguishers are filled with water and pressurized with oxygen. Again - water extinguishers can be very dangerous in the wrong type of situation. Only fight the fire if you're certain it contains ordinary combustible materials only.
- **Dry chemical extinguishers** come in a variety of types and are suitable for a combination of Class A, B, and C fires. These are filled with foam or powder and pressurized with nitrogen.
    - **BC -** This is the regular type of dry chemical extinguisher. It is filled with sodium bicarbonate or potassium bicarbonate. The BC variety leaves a mildly corrosive residue which must be cleaned immediately to prevent any damage to materials.
    - **ABC -** This is the multipurpose dry chemical extinguisher. The ABC type is filled with monoammonium phosphate, a yellow powder that leaves a sticky residue that may be damaging to electrical appliances such as a computer.

Dry chemical extinguishers have an advantage over CO2 extinguishers since they leave a non-flammable substance on the extinguished material, reducing the likelihood of re-ignition.

- **Carbon Dioxide (CO2) extinguishers** are used for **Class B and C fires**. CO2 extinguishers contain carbon dioxide, a non-flammable gas, and are highly pressurized. The pressure is so great that it is not uncommon for bits of dry ice to shoot out the nozzle. They don't work very well on Class A fires because they may not be able to displace enough oxygen to put the fire out, causing it to re-ignite.

CO2 extinguishers have an advantage over dry chemical extinguishers since they don't leave a harmful residue - a good choice for an electrical fire on a computer or other favorite electronic device such as a stereo or TV.

It is vital to know what type of extinguisher you are using. Using the wrong type of extinguisher for the wrong type of fire can be life-threatening.

These are only the common types of fire extinguishers. There are many others to choose from. Base your selection on the classification and the extinguisher's compatibility with the items you wish to protect.

VI. URBAN SEARCH AND RESEACH MARKING SYSTEM

FEMA US&R Task Force Marking System is identified and divided into two sections:

- Structure/Hazards Evaluation Marking
- Search Assessment Ranking

The Structure/Hazards Evaluation and Search Assessment marking procedures are designed to identify specific information pertinent to each affected building. Each component can be completed independent of the other, although normally the Structure/Hazards Evaluation would be completed first. Symbols will be conspicuously made with spray paint of International Orange color to permanently identify and mark safe entrances to a structure. The Search Assessment findings would be similarly denoted with the same orange spray paint. The two marking systems use differing formats to distinguish between the two as outlined in their respective sections.

A. Structure/Hazard Evaluation Marking

The structures specialist and other trained field operation members, as appropriate, will outline a 2' X 2' square box at any entrance accessible for entry into a compromised structure. Aerosol cans of spray paint, International Orange color, will be used for this marking. It is important that an effort is made to mark all normal entry points to a building under evaluation to ensure that field operation personnel can identify that is has been evaluated.

Specific markings will be clearly made inside the box to indicate the condition of the structure and any hazards at the time of this assessment. Normally the square box marking would be made immediately adjacent to the entry point identified as safe. An arrow will be placed next to the box indicating the direction of the safe entrance if the Structure/Hazards Evaluation marking must be made somewhat remote from the safe entrance.

Depictions of the various markings are as followings:

Structure is accessible and safe for search and rescue operations. Damage is minor with little damage of further collapse.

Structure is significantly damaged. Some areas are relatively safe, but other areas may need shoring, bracing, or removal of falling and collapse hazards. The structure many be completely pancaked.

Structure is not safe for search and rescue operations and may be subject to sudden additional collapse. Remote search operations may proceed at significant risk. If rescue operations are undertaken, safe haven areas and rapid evacuation routes should be created.

Arrow located next to a marking box indicates the direction to the safe entrance to the structure, should the marking box need to be made remote from the indicated entrance.

HM

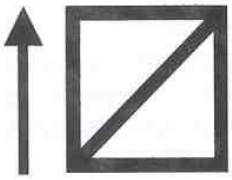
Indicates that a Hazardous Material (Haz Mat) condition exists in or adjacent to the structure. Personnel may be in jeopardy. Consideration for operations should be made in conjunction with the Hazardous Materials Specialist. Type of hazard may also be noted.

The following information: TIME, DATE, and SPECIALIST ID, will also be noted outside the box at the upper right-hand side. This information will be made with pieces of carpenter's chalk or lumber crayon. An optional method may be to apply duct tape to the exterior of the structure and the detailed information written on the tape with a grease pencil or black magic marker.

B. Task Force Marking System

All task force personnel must be aware of other Structure/Hazards Evaluation marking made on the interior of the building. As each subsequent assessment is performed throughout the course of the mission, a new TIME, DATE, and SPECIALIST ID entry will be made (carpenter's chalk or lumber crayon) below the previous entry, or completely new marking box made if the original information is now incorrect.

The following illustration shows the various components of the Structure/Hazards Evaluation marking system:



7/15/91 1310 hrs.
HM - natural gas
OR-TF1

This depiction indicates that a safe point of entry exists above the marking (possibly a window, or upper floor, etc.). The single slash across the box indicates the structure may require some shoring or bracing before continuing operations. The assessment was made on July 15, 1991 at 1:10 PM. There is an apparent indication of natural gas in the structure. This evaluation was made by the #1 task force out of the State of Oregon. It should be understood that this building would not be entered until the Haz Mat (natural gas) had been mitigated. When performed, the marking should be altered by placing a line through the "HM," and adding the time and task force who performed the mitigation. An entirely new mark could also be added when the mitigation is done, or after any change in conditions such as an aftershock.

Marking boxes would also be placed in each of the specific areas within the structure (i.e. rooms, hallways, stairwells, etc.) to indicate conditions in separate parts of the building.

C. Search Assessment Markings

A separate and distinct marking system is necessary to denote information relating to the victim location determinations in the areas searched. This separate Search Assessment marking system is designed to be used in conjunction with the Structure/Hazards Evaluation marking system. The Canine Search Specialists, Technical Search Specialists, and/or Search Team Manager (or any other task force member performing the search function) will draw an “X” that is 2’ X 2’ in size with International Orange color spray paint. This X will be constructed in two operations – one slash drawn upon entry into the structure (or room, hallway, etc.) and a second crossing slash drawn upon exit.

Single slash drawn upon entry to a structure or area indicates search operations are currently in progress.

Crossing slash personnel exit from the structure or area.

Distinct markings will be made inside the four quadrants of the X to clearly denote the search status and findings at the time of the assessment. The marks will be made with carpenter chalk or lumber crayon. The following illustrations define the Search Assessment marks:

LEFT QUADRANT – FEMA US&R task force identifier

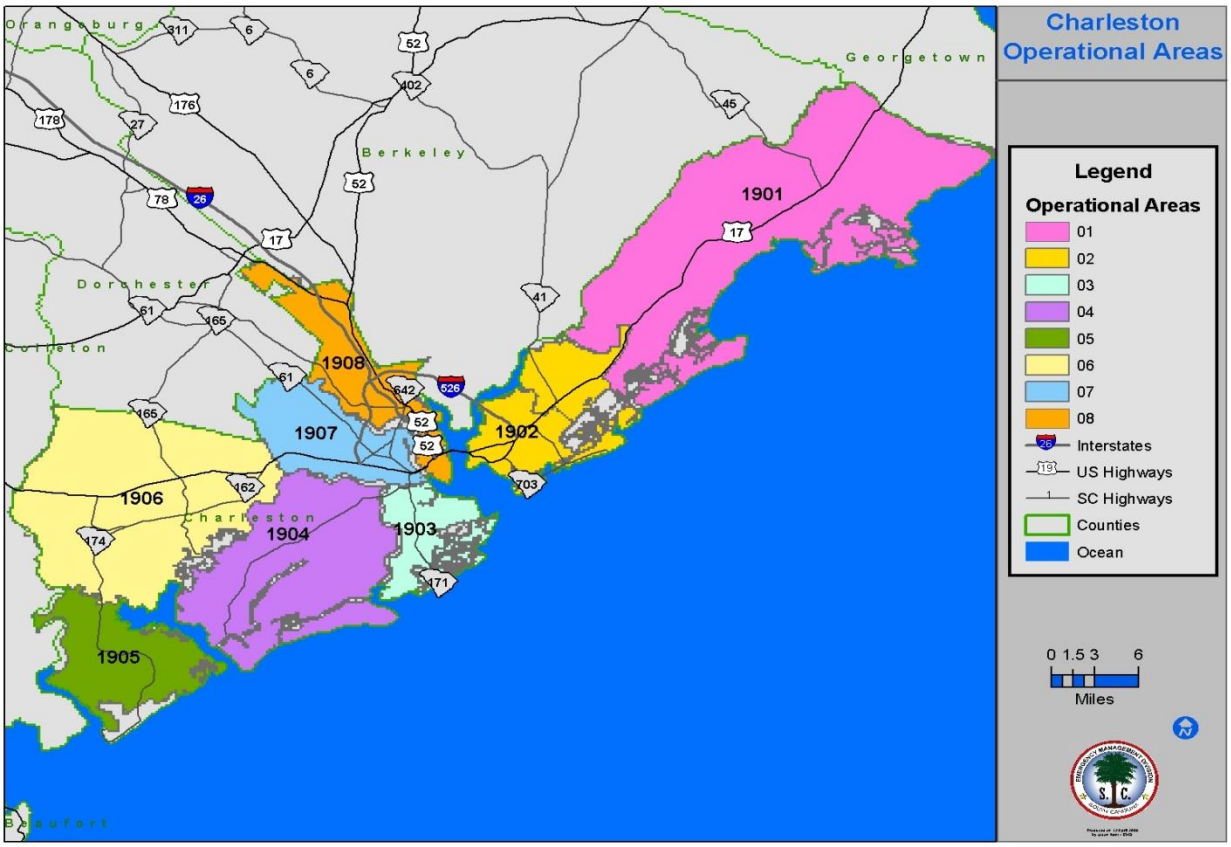
TOP QUADRANT – Time and date that the task force personnel left the structure.

RIGHT QUADRANT – Personal hazards.

BOTTOM QUADRANT – Number of live and dead victims still inside the structure. [“O” = no victims]

Search personnel shall use International Orange colored spray paint to mark the exact location of a victim alert. In addition, surveyors tape may be used as a flag to denote the appropriate area, in conjunction with the spray paint marking.

D. Charleston Operational Areas Map



VII. GLOSSARY

- Aftershocks – Earthquakes that follow the largest shock of an earthquake sequence. They are usually smaller than the main shock.
- Completely Destroy – Unusable for occupancy
- Ground Motion – Vibration and shaking of the ground during an earthquake is the most far-reaching effect and causes the most damage to building infrastructures, lifelines, etc.
- Emergency Operations Center – The site from which government officials (municipal, county, state, and federal) exercise direction and control in an emergency/disaster.
- Emergency Sheltering – Humanitarian relief during the first 72 hours following a disaster. In an earthquake disaster, citizens affected may need to be self-sufficient for the first three to five days.
- Epicenter – The location of the earth's surface that lies directly above the focus of an earthquake.
- Focus – The point within the earth at which rupture commences and the earthquake originates.
- HAZUS – Hazards United States (HAZUS) is a standardized geographic information system (GIS) based loss estimation tool to estimate potential losses from earthquakes, wind, and flood.
- Intensity – A number (written as a Roman numeral) describing the severity of an earthquake in terms of its effects on the earth's surface and on humans and their structures. The best-known method for expressing intensity is the Modified Mercalli Scale.
- Interim Housing – Longer-term shelter provided and funded by the government to the victim. Begins when short-term sheltering ends, and continues 30 to 180 days. The occupants have their own lock and key. This type of housing could include cruise ships, hotels, motels, direct lease, rehab public housing, and emergency group sites (i.e., travel trailers).
- Isoseismal – A contour or lines on a map representing points of equal intensity for a particular earthquake.
- Logistic Staging Areas (LSA) – A temporary site established to store and distribute resources to aid state and local jurisdictions in the response to and recovery from disasters.
- Long-Term Recovery – Focus on redeveloping communities and restoring the economic viability of the disaster area(s).
- Liquefaction – The ground temporarily loses its strength and behaves as a viscous fluid (similar to quicksand) rather than a solid.
- Magnitude – A number that characterizes the relative size of an earthquake. It measures the total amount of energy released during an earthquake.

- Moderate Damaged (AT) – A building requiring inspection before reuse.
- Operational Area (OA) – Geographically isolated areas within a large disaster area. The operational areas are based on infrastructure damage/barriers, easily recognized geographic features, political boundaries, and population
- Rapid Response Team (RRT) – Specialized teams that provide detailed damage assessment and human service assistance within a specific Emergency Support Function (ESF).
- Relocatable Facility – A mobile classroom; typically located on school property and used by students.
- Seismicity – The geographic and historical distribution of earthquakes.
- Seismic Zone – An area of seismicity probably sharing a common cause. Example: "Middleton Place-Summerville Seismic Zone (MPSSZ)."
- Seismogram – A record written by a seismograph in response to ground motions produced by an earthquake.
- Seismograph – A term that refers to the seismometer and its recording device as a single unit.
- Seismometer – An instrument that detects and records the motion of the earth's surface.
- Short-term Sheltering – A shelter (congregate housing) is typically defined as housing for day 1 through day 30 (could be longer) where the residents do not have a lock and key.
- Short-term Recovery – Efforts focus on the restoration of essential public services. American Red Cross defines short-term recovery as 30 days or less.
- State Emergency Response Team (SERT) – An emergency management team consisting of state agencies and volunteer organizations designed to manage the state's response effort during emergencies and disasters. The team is organized in emergency support functions.
- Temporary Housing – Financial or direct assistance from government to individual. Occupants have their own lock and key. This type of housing could include transient reimbursement, rental assistance, and direct housing.
- Tent Cities – Built sheltered areas that provide the minimum full range of services to the dislocated population in a catastrophic disaster. Services include housing, feeding, showers, laundry, sewage, security, and access to state and not-for-profit assistance. Tent cities are also known as catastrophic shelters.

VIII. ACRONYMS

ARC – American Red Cross

B&CB – Budget and Control Board

CAP – Civil Air Patrol

CFR – Code of Federal Regulations

CIO – Division of State Chief Information Officer (Budget and Control Board)

COG – Council of Government

CST – Civil Support Team

CULPH – Clemson University Livestock-Poultry Health

DCE – Federal Defense Coordinating Element

DCO – Defense Coordinating Officer

DFO – Disaster Field Office

DHS – Department of Homeland Security (Federal)

DEP&R – Directorate of Emergency Preparedness & Response (Federal)

DMAT – Disaster Medical Assistance Team (Federal)

DMORT – Disaster Mortuary Operational Response Team (Federal)

DOD – Department of Defense (Federal)

DPS – Department of Public Safety

EAS – Emergency Alert System

ECN – Emergency Communications Network

ECV – Emergency Communications Vehicle

EMAC – Emergency Management Assistance Compact

EOC – Emergency Operations Center

EPA – Environmental Protection Agency (Federal)

EQC – Environmental Quality Control

ESF – Emergency Support Function

ETA – Estimated Time of Arrival

ETV – Educational Television

FAA – Federal Aviation Administration (Federal)

FCO – Federal Coordinating Officer

FEMA – Federal Emergency Management Agency (DHS-EP&R) (Federal)

FRCC – Farrow Road Command Center

GETs – Government Emergency Telephone Services

GIS – Geographic Information System

HAZMAT – Hazardous Materials

HAZUS – Hazards United States

HF – High Frequency

IAP – Incident Action Plan

IC – Incident Commander

ICP – Incident Command Post

ICS – Incident Command System

IMST – Incident Management Support Teams

IMAT – Incident Management Assist Teams (FEMA)

JISCC – Joint Incident Site Communications Capability

LART – Large Animal Rescue Team

LGR – Local Government Radio

LLR – Department of Labor, Licensing and Regulation

LSA – Logistical Staging Areas

LST – Landing Ship Tanks

LZ – Landing Zone

MERS – Mobile Emergency Response Support (Federal)

MHz – Megahertz

MMI – Modified Mercalli Intensity

MMO – Materials Management Office

MMRT – Midlands Medical Response Team

MOA – Memorandum of Agreement

MOU – Memorandum of Understanding

MPSSZ - Middleton Place-Summerville Seismic Zone

MRE – Meals Ready to Eat

NAWAS – National Warning System (Federal)

NDMS – National Disaster Medical System (Federal)

NEIC – National Earthquake Information Center

NIMS – National Incident Management System

NRF – National Response Framework

NOAA – National Oceanic and Atmospheric Administration

OPCON – Operating Condition

OTAG – Office of the Adjutant General

OTG – Operations Tasking Group

PIO – Public Information Officer

POC – Points of Contact

RACES – Radio Amateur Civil Emergency Service

RNA – Rapid Needs Assessment Team (FEMA)

ROC – Region IV Operations Center (FEMA)

RRT – Rapid Response Team

SA – Salvation Army

SA – Staging Area

SACC – Southern Area Coordination Center

SAD – State Active Duty

SAFE – State Animal Fund for Emergencies

SAT – State Assessment Team

SCDC – SC Department of Corrections

SCDHEC – SC Department of Health and Environmental Control

SCDMH – SC Department of Mental Health

SCDNR – SC Department of Natural Resources

SCDOA – SC Department of Agriculture

SCDOC – SC Department of Commerce

SCDOE – SC Department of Education

SCDOI – SC Department of Insurance

SCDOT – SC Department of Transportation

SCDPS – SC Department of Public Safety

SCDSS – SC Department of Social Services

SCDOT – SC Department of Transportation

SCEMD – SC Emergency Management Division

SCEOP – SC Emergency Operations Plan

SCETV – SC Educational Television Network

SCFC – SC Forestry Commission

SCHP – SC Highway Patrol

SCNG – SC National Guard

SCORERP – SC Operational Radiological Emergency Response Plan

SCPPP – SC Probation, Parole and Pardon Services

SCPRT – SC Parks, Recreation and Tourism

SCTF-1 – SC Urban Search & Rescue Team

SCTRERP – SC Technical Radiological Emergency Response Plan

SEOC – State Emergency Operations Center

SERT – State Emergency Response Team

SLED – South Carolina Law Enforcement Division

SNPS – Strategic National Pharmaceutical Stockpile

SOP – Standard Operating Procedures

SRS – Savannah River Site

SSTV – Slow Scan TV

STOLS – Surface Towed Ordnance Location System

TAT – Technical Assistance Team (DHEC's HAZMAT TEAM)

UC – Unified Command

US&R – Urban Search and Rescue team (FEMA)

USCG – US Coast Guard (Federal)

VMAT – Veterinary Medical Assistance Team (Federal)

VOLTAG – Voluntary Technical Assistance Group

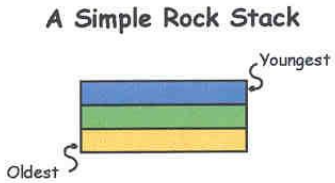
WP – Warning Point

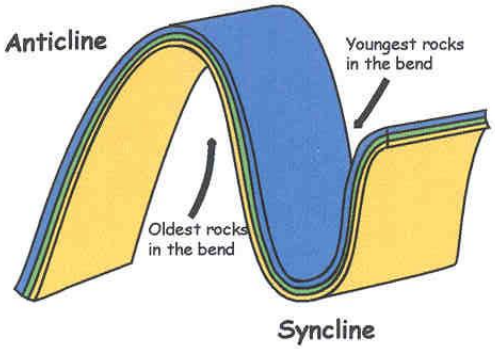
Fold Systems - 1

Rocks are deformed (squeezed) into folds generally deep within the Earth's crust. To produce folds, the process of deformation is much like taking a piece of rug and holding down one end while slowly pushing from the other end. If you continue to push the ends together, the rug will develop one or more folds, giving the surface a "rippled" look.

Two of the most common types of folds are anticlines and synclines. If the letter "S" is laid on its side, it looks much like an anticline-syncline pair.

Anticlines and synclines are easy to understand if one imagines a stack of pancakes. As the pancakes are cooked, they are stacked one on top of the other in a pile. The first cooked is on the bottom and the last cooked is on the top. Rocks are stacked in a similar fashion: the oldest rocks are on the bottom of the pile and the youngest are on the top. As the stack of rocks is folded, the oldest rocks are pushed up in the middle of an anticline and the youngest rocks are pushed down in the middle of a syncline. In eroded folded areas, the location of the oldest rocks in relation to the youngest rocks defines whether you are looking at an anticline or a syncline.





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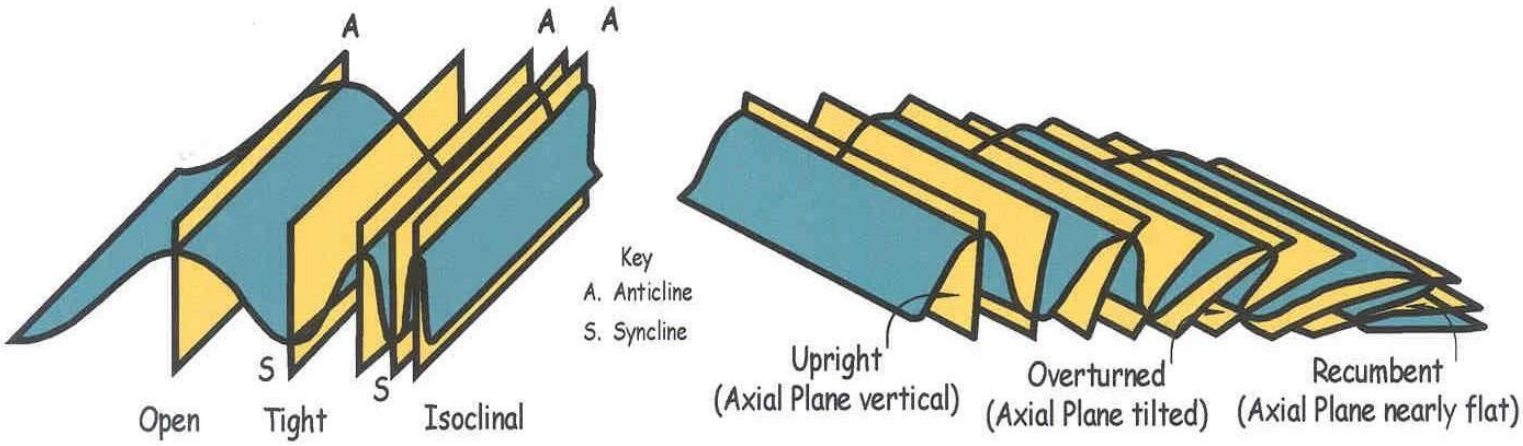
Fold Systems - 2

Anticlines and synclines can take on many different geometries. They can be open, tight, or isoclinal in shape. The tighter the folds, the more intense the stress (compression) that caused folding. Folds can also be symmetric or asymmetric, upright or overturned, curved or cornered. A fold "knocked" on its side is called recumbent. Folds don't have to be perfectly horizontal, often folds are not, because of twisting and tilting, and they can plunge into the Earth at an angle.

Folds occur on all scales. Some are small enough to be contained in a hand-held rock specimen. Others cover large areas, so large that they can be seen from miles away.

In a road cut along a highway, fold types are often easily identified by the orientation of the buckled layers. Fold patterns observed at the Earth's surface are also clues to the existence and type of fold that may be beneath the surface.



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SOUTH CAROLINA BAPTIST CONVENTION

Disaster Relief Office

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This SCBC resource is made possible through the Cooperative Program giving of South Carolina Baptist churches.

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