CHAPTER 7

COMMONWEALTH CLIMATE AND WEATHER

7. 1. OUR COMMONWEALTH'S CLIMATE

7. 1. 1. Introduction

The climate of our Northern Marianas is typical of many tropical Pacific islands. The climate type here is called both **tropical marine** and **tropical monsoon**. This is due to the nearness of the equator and the influence of our warm, surrounding ocean waters. Here, it is generally warm and humid with little seasonal or daily changes in temperature. We have distinct wet and dry seasons.

Northeast trade winds blow much of the year. In addition, typhoons are common in our area. Squalls and thunderstorms are frequent in summer. Typhoon season runs from July to December, but typhoons occur most often from October to December. Although much less frequent in other months, it is possible for typhoons to develop any month of the year.

Usually, it is sunny with widely scattered clouds moving over our islands. Cloudiness is greatest from July through January and is more widespread over the islands than over the ocean. Fog and haze are rare in our Commonwealth and, of course, it never snows.

7. 1. 2. In a Transition Zone

The Marianas are in the transition zone between the **monsoons** and the northeast **trade winds**. Our islands lie both in the trade wind latitudes and on the eastern fringe of the Asiatic monsoon area. Our climatic conditions are largely the product of the interaction of trade winds and monsoons.

7. 1. 3. Average Annual Precipitation

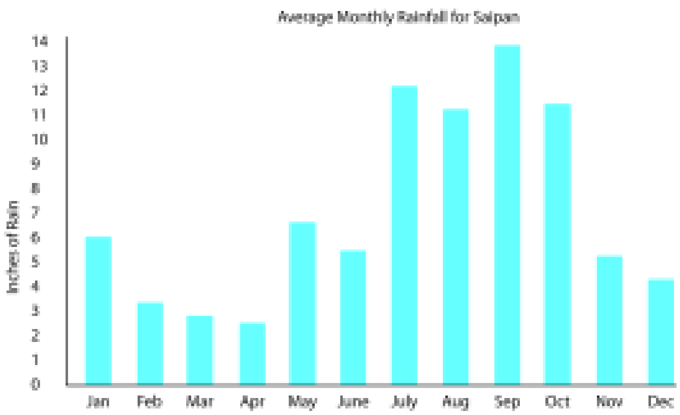
Rainfall is abundant in the southernmost Mariana Islands. Here it ranges from an annual average of 82 inches on Saipan to between 97 and 121 inches on Rota. The greater amount falls on Rota's Sabana uplands. On an annual basis Saipan's Mt. Tapotchau also receives more rain than the island's lower elevations, averaging almost 110 inches per year.

The climate of our Northern Marianas is typical of many tropical Pacific islands.

In contrast to our southernmost islands, on Pagan to our north the average annual rainfall is 75 inches. Yearly rainfall averages decrease as one travels further north up the CNMI island chain.

7. 1. 4. Month by Month Chart

On Saipan, more than two-thirds of the annual amount of rain falls from July to October. April is our driest month.



Average precipitation in the Northern Marianas.

7. 1. 5. Our Rainy and Dry Seasons

As mentioned, there are distinct wet and dry seasons in the CNMI. The dry season extends from about mid-December to mid-June. Despite the reference to dryness, periodic rains can be expected during the dry season. Fortunately, breezes are fairly constant during this part of the year.

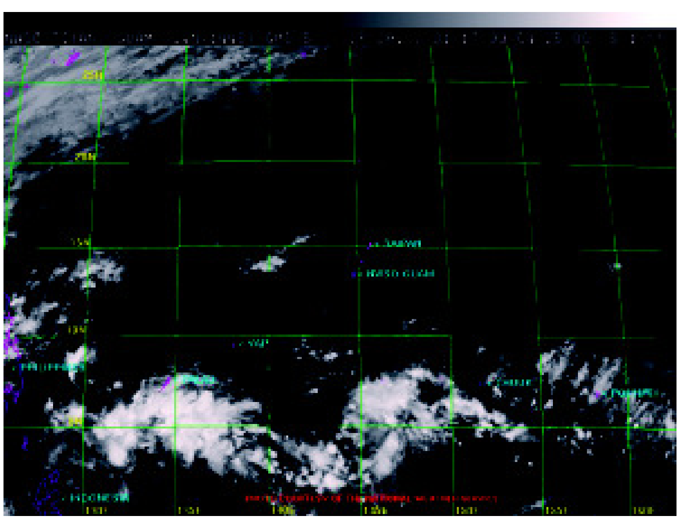
As the earth makes its annual orbit around the Sun, the part of the earth that receives the most direct sun rays changes with the seasons.

Referred to as the “equatorial low”, this band of warm moist air annually shifts to the north, then to the south, then, in the following year, back again to the north of the equator.

The equatorial low follows the sun’s most direct solar rays. This is the area of the most intense heating of the earth’s ocean and land surfaces.

The equatorial low passes the southern Marianas between May and October, causing rainy and unsettled weather, so this time of year is called our wet season. This system is sometimes called the **Inter-Tropical Convergence Zone** (or **ITCZ**).

As discussed in the previous chapter, the subtropical high zones shift north and south as the ITCZ shifts. When the subtropical high is over our area, it is our dry season.



The Intertropical Convergence Zone over Micronesia.

7. 1. 6. The Transition Months

Mid-November to Mid-December is a transition period, from rainy to dry. Likewise, Mid-June to Mid-July is a transition from the dry to the wet season.

7. 1. 7. Average Temperature and Humidity

Temperatures in the Commonwealth range from 71 to 95 degrees Fahrenheit. Monthly averages range from 75° to 85° F. Despite the seemingly broad range and difference between the night and daytime averages, the daytime temperature in the CNMI is almost always the same, just around 86 degrees.

In fact, the town of Garapan on the Island of Saipan is in the *Guinness Book of World Records*. It has the steadiest most equable temperature on our planet, with the smallest variation anywhere on earth.

On Saipan, *relative humidity* averages 78 percent in winter and 84 percent in summer. Other islands have similar readings.

7. 1. 8. Average Wind Speeds

Year round, the average wind speed is 10.5 miles per hour, but during storms, of course, wind speeds increase and may reach speeds of more than 150 miles per hour.

7. 1. 9. Winds Month by Month

Winds in the southernmost Mariana Islands come from the northeast or the east for nearly three-fourths of the year, particularly in the Autumn and Winter.

Trade winds are pronounced and persistent from January through May. At this time, the winds blow from the northeast and east-northeast more than 90 percent of the time.

Wind directions are more variable from July through October. During this period, they can switch directions, often blowing from the east-northeast in May and June, from the east-southeast in July, from the south-southwest in August, and from the southwest in September.

One way to be aware of the changes in wind direction is when we see the airplanes landing at our airports in the opposite direction from usual. Pilots know it is always best to take off and land into the wind.

As recorded on Pagan, winds in our northernmost islands are from the east from the end of May to mid-July, and from the west during the rest of the year. Our northernmost islands are under a different wind and ocean current regime than our southern ones.

7. 2. COMMONWEALTH WEATHER

7. 2. 1. Storms; an Introduction

In general two principle kinds of storms contribute to the overall climatic character of our Commonwealth. One is the small scale storm, consisting of **thunderstorms** and **squalls**. The small scale squalls and thunderstorms may cover an area of only a few square miles. They are usually brief in duration as they pass over our islands.

The second is the large scale, *tropical cyclonic circulation systems* referred to as:

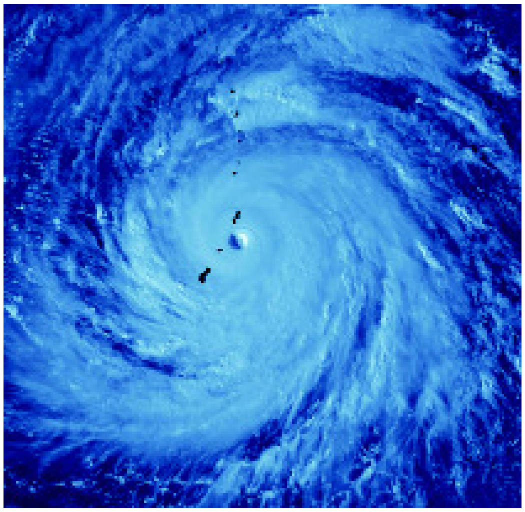
1) **tropical depressions**,
2) **tropical storms**,
3) **typhoons**, and
4) **super-typhoons**,

The different names are based upon sustained wind speeds. The larger tropical cyclonic circulation systems may dominate an area as large as 300,000 square miles and may persist for a week or more. Each of these is discussed in more detail below.

7. 2. 2. Thunderstorms

A thunderstorm is the least dangerous of the violent storms, but it can still cause damage to property and even kill people. Thunderstorms are normally very short-lived in the Marianas, and usually do not last more than an afternoon.

An anemometer - used to measure wind speed



Supertyphoon Keith passing between Rota and Tinian

A thunderstorm photographed from the Space Shuttle.

Masses of warm, moist air rising rapidly into colder and drier upper air cause thunderstorms. The warm moist air cools and condenses to form clouds called **cumulonimbus clouds**.

Cumulonimbus clouds look like cotton, with flat bottoms and anvil-shaped tops reaching to heights of 70,000 feet. They are usually dark gray in color (at least towards the bottom) due to the shading of sunlight. These often have rain falling from them. This rain only lasts for a short time. **Thunder** and **lightning** often accompany these storms.

Lightning can leap from cloud to cloud or from a cloud to the surface of the earth.

7. 2. 3. Lightning

During a thunderstorm, the air rises very quickly which causes an electrical charge to build up in the clouds. The buildup discharges as a bolt of lightning. Lightning can leap from cloud to cloud or from a cloud to the surface of the earth. A bolt of lightning can discharge millions of volts of electricity. This much electricity can cause great damage.

7. 2. 4. Thunder

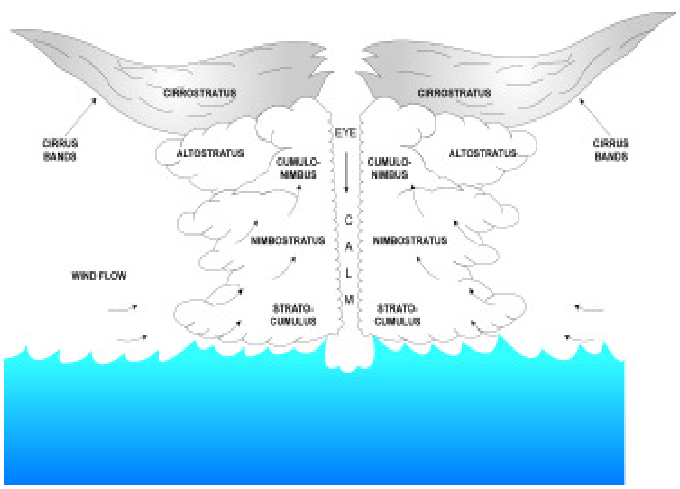
Thunder starts with lightning. When lightning cracks across the sky, it heats the air in its path to temperatures as high as 60,000°F (33,316°C). That's about six times hotter than the surface of the sun. The air expands at supersonic speed, sending off shock waves which greet our ears as the boom of thunder.

To find out how far away a thunderstorm is, we must start to count as soon as we see a bolt of lightning, and stop when we hear thunder. For every five seconds between the lightning bolt and thunder, the storm is one mile away.

7. 3. TYPHOON AND OTHER TROPICAL STORM WINDS

7. 3. 1. Introduction

Typhoons are defined as a type of tropical cyclone that has sustained winds of at least 75 miles per hour which travel around a distinct low pressure center. The air around the center of a typhoon rises very quickly and surrounding air is drawn rapidly toward the center, while the air in the middle of the typhoon is actually falling. Because of the *Coriolus effect,* all of these air masses together within the typhoon start to spin.



The air around the center of a typhoon rises very quickly and surrounding air is drawn rapidly toward the center, while the air in the middle of the typhoon is actually falling.

7. 3. 2. The Energy that Forms and Feeds Typhoons

Typhoons begin as **tropical disturbances** which had earlier developed from a combination of several thunderstorms. Wind speeds continue to get stronger. The disturbance grows to a **tropical depression**, then to a **tropical storm**. If the sustained winds reach 75 nautical miles per hour it is classified as a typhoon.

A typhoon gets its energy from the moist, sun-warmed, water vapor-rich air that rises from a tropical sea's surface. This moisture cools and condenses as it rises high into the atmosphere.

The water molecules evaporate from the ocean's surface. It takes a substantial amount of extra heat to evaporate each water molecule since they have a tendency to stay with the ocean's water. Each molecule of water retains some of this energy in the form of heat. It is called the **latent heat of evaporation**.

Higher up, when condensation occurs, this heat is released to the air. Each water molecule gives off a large amount of heat when it condenses into a water droplet. This is called the **latent heat of condensation**. As mentioned in the last chapter, this is nearly 600 kilocalories for each kilogram of condensed water. This extra heat causes the air to rise even higher and faster as it travels around the center of the storm.

7. 3. 3. Typhoon Development

Typhoons may develop if conditions are *just* right, including:

- No strong high atmosphere winds to blow the tops off the rising storm clouds;
- Continued warmer than usual sea water temperatures;
- A lower than usual localized developing low pressure area, into which winds blow the region's several developing thunderstorms; and
- A good Coriolus effect

...then...

- Huge combinations of thunderstorms revolving and feeding into each other will combine into massive cyclonic storms called *typhoons*.

Typhoons can easily sink ships and cause great damage when they hit land.

With all of this energy, typhoons can easily sink ships and cause great damage when they hit land. In addition to the damage from the wind, flooding occurs because of the great amounts of rain that accompany a typhoon and from the wind-driven storm surge.

7. 3. 4. Typhoon/Tropical Storm Rating System

As we can see, typhoons are the last stage of a whole group of storms joining together, which is caused by rapidly rising and spinning air. Which type of storm develops depends on how fast the wind spins around the center of the storm. Tropical storms are classified by the speed of their winds near the center.

The following is a list of tropical storm types, in increasing order, with the wind speeds around the center of each:

Tropical Disturbance — sustained center winds up to 23 mph.
Tropical Depression — sustained center winds 24 to 38 mph.
Tropical Storm — sustained center winds 39 to 74 mph.
Typhoon — sustained center winds 75 to 137 mph
Super Typhoon — sustained center winds above 138 mph.

Note: The above numbers are in nautical miles per hour.

Average number and percent of tropical cyclones and tropical-storms of great intensity annually, worldwide.

7. 3. 5. The Eye of a Typhoon

Air rises very fast around the **eye of a typhoon**. However, as mentioned, in the eye itself, air is rapidly descending. Because the air is falling very fast, straight down in the middle of the typhoon, no horizontal winds blow in the eye.

In satellite photographs of typhoons, we can see this eye as a blank space in the center of a typhoon since there are no clouds there. Found only in cyclones of at least 75 mph, this eye is a clear sign that the storm is a typhoon.

7. 3. 6. Where Typhoons Occur

Typhoons can only form over very specific areas of the earth's surface. Typhoons need moist, warm air to be born. This warm moist air is only found over warm tropical oceans between 5 - 20°N and between 5 - 20°S.

Typhoons cannot form within five degrees of the Equator because the Coriolus effect is too small there to cause storms to spin. Once a typhoon moves toward cooler oceans or onto land, it begins to die because it no longer has the warm moist air to feed it and give it energy.

When the eye wall of a typhoon hits one our islands, it often does much damage. This damage can extend to homes...

7. 3. 7. Typhoon Frequencies

On average there is at least one typhoon per year that passes over, or very close to, one of the islands in our island archipelago (CNMI and Guam). It is predicted that in any particular year the chance of one passing close enough to affect one our southernmost Mariana islands is 1 in 3. You may recall that in recent years the island of Guam had five typhoon passes in just one year.

Our islands are often in the storm track of typhoons because of our location on the western edge of the Pacific Ocean. A super-typhoon hits one of our islands approximately every ten years.

7. 3. 8. Typhoon Damage

When the **eye wall** of a typhoon hits one our islands, it often does much damage. The rains cause flooding. The water from the rainfall and the wind cause erosion of the land which results in mud slides, road damage, and the deposit of sediment on coral reefs. This sedimentation can kill a reef by smothering the corals. The winds can kill trees and animals. The winds can also destroy the habitats that organisms need for survival.

...marine facilities...

Large ocean waves caused by typhoons can alter reefs, erode beaches, and cause saltwater flooding of low-lying areas. This flooding can kill plants and put salt into the soil making it hard for some plants to grow. Typhoons are very dangerous and can cause great environmental destruction.

7. 4. OUR FOUR RAINFALL REGIMES AND STORMWATER CONTROL PLANNING

7. 4. 1. Our Trade Winds Rainfall Regime

The trade winds regime is common to our Commonwealth's dry season. It also occurs during our Spring and Fall transition seasons. Trade winds happen when northeasterly trade winds dominate our atmosphere's air flow.

Trade winds are characterized by winds that always blow from the east or slightly northeast. In earlier times, commercial trade sailing ships used these constant wind pathways to travel across the seas, hence the name.

Trade winds frequently cut off the vertical extent of the growth of convective cumulus clouds. If you watch a cloud forming and when it reaches a peak the top blows off, this is due to the trade winds.

Trade winds spawn only light to moderate, short-lived showers. The rainfall that results from trade wind storms tends to fall more on the tops of our islands than on lower elevations. We say that this regime is strongly influenced by *topography*.

We also describe such rainfall as showing an **orographic** effect. *Oro* refers to mountains, and *graphic* refers to geography or land area. In many parts of the world there is a higher rainfall (or snow in many cases) on the tops of mountains than down on lower elevations. Now that you know about rising air and rain, can you figure out why this is so? Yes, the moisture in the rising air cools and condenses.

...and entire communities.

7. 4. 2. The Thunderstorm Rainfall Regime

The thunderstorm regime usually occurs when winds are light. This is because the trade winds do not blow off the tops of the rising cumulus clouds. They are allowed to build and build.

When it reaches a very towering height, each cloud has a great deal of water vapor, water, and, when very high, even ice and sleet within it. The thunderstorm regime primarily occurs in the rainy season and during the transition seasons.

The regime also occurs whenever the band of an upper-level, low pressure system moves across our islands. These are sometimes called **shearlines**. They travel across our islands moving in from the north.

These low pressure weather lines originally begin as cold weather fronts in Asia. By the time they reach our area, however, there is little difference between the air temperatures on either side of the low pressure front.

Instead of *cold fronts* or *warm fronts*, here in the tropics we call these equal temperature fronts *shearlines*. The low pressure center that sets up the cold front remains far to the north.

Thunderstorms can also be strongly influenced by topography. The ways that winds blow up and around mountains determine where the developed thunderstorms will go. Sometimes they will be pushed directly over the mountain tops by the winds and sometimes they will pass to one side of it.

Remember from our discussion above that rains from our trade wind regimes occur mostly on the tops of the mountains? The rainfall *distribution* from thunderstorms around our islands are far less predictable than with the trade wind regime.

If we know the seasonal wind direction, we might be able to anticipate where the wind will blow the rain clouds, but we will probably not know just where the clouds will drop the rain.

The Monsoon and Typhoon-edge Rainfall Regimes both produce long periods of light rain with several daily episodes of heavy rain.

7. 4. 3. The Monsoon and Typhoon-edge Rainfall Regime

Our third regime is the monsoon and the typhoon-edge types. Both of these occurrences produce long periods of light rain with several daily episodes of heavy rain. Monsoons and the edges (or *peripheries*) of typhoons, can cause a 24 hour rainfall amount of up to 9 inches. These two events occur in the rainy and transition seasons. More is discussed below regarding 24 hour rain totals and their importance in resource planning.

Since these events are largely governed by the large-scale circulation of the atmosphere, their rainfall distribution is less influenced by topography. However, topography is still important during the lighter rain periods.

These periods of lighter rainfall occur when the southwest monsoon surges across our islands. They also occur when tropical cyclones move close to our islands, but the eye and eye-wall cloud do not directly hit us.

Resource managers and civil engineers plan and design flood-control measures such as sediment control ponding basins...

7. 4. 4. Typhoon Core Rainfall Regime

Our fourth type of rainfall regime is the typhoon core. This type of regime results from the very close passage or the direct hit of a tropical storm or typhoon and its inner rain bands.

The rainfall rates are governed by the large-scale vertical motion in the typhoon. They are *not* influenced by our island's relatively low topography. During these events, just as much rain falls in coastal areas as at higher elevations. The rainfall totals are largely governed by the location of the rainbands as they sweep over us.

7. 4. 5. Lessons Learned from Tropical Storm Steve, Storm Return Periods and Sediment Pollution Prevention Plans

Resource managers and civil engineers need to have a good understanding of heavy rainfall amounts and frequencies. These individuals work to plan for and design our stormwater drainage systems. In their plans they calculate proper sizes for building storm drain pipes and sediment control **ponding basins**.

...and culverts.

The planners need to consider how wide the pipes (called **culverts**) should be and how much rainfall should be retained on a project development site during its land clearing phases.

If too small of a culvert diameter is used, then too much water would run over the outlets and undercut our roads. If culverts were built too large, then our public's tax money, which could have been better spent elsewhere, would be wasted.

Additionally, if project development ponding basins are too small, then not enough settling of runoff sediments would occur and unnecessary water pollution would result.

The type of rainfall distribution discussed above for typhoon core regimes was graphically illustrated by the rainfall distribution charted for Tropical Storm Steve. It passed just north of Saipan on August 8, 1993.

The major rain band outside the eye wall of T. S. Steve dropped very heavy rainfall over the central and southern part of Saipan. Planners did not anticipate a heavy rainfall because the charts they consulted predicted light rainfall for these areas.

Commonwealth environmental planners were surprised by the rainfall data gained about Tropical Storm Steve. Using maps available at the time, the agencies informed the general public that a storm with very high rainfall, such as Steve's, probably occurs only once every 100 years.

However, after announcing this, a more careful look at the distribution of the rainfall showed that the areas where more rainfall was expected got less rainfall. The data also showed that the areas where less rainfall was expected got more. The maps might have been wrong.

The CNMI Division of Coastal Resource Management and the US Soil Conservation Service together asked meteorologists from the Water and Environment Research Institute (WERI), affiliated with the University of Guam, to help them analyze data collected from Tropical Storm Steve.

The staff of the Institute also looked at typhoon rainfall data from the CNMI in other years. The Institute's analysis showed that the CNMI and Federal government resource staff were incorrectly applying a U.S. mainland model for predicting storm intensities.

As mentioned, the prediction of storm intensities is very important in resource management. These predictions are used to develop our islands' storm water collection systems. They are also used to develop appropriate environmental regulations for erosion and sediment control.

Controlling rainfall runoff is vital to the protection of our nearshore waters and coral reef ecosystems. We will discuss the sensitivity of corals to sediments more fully in later chapters.

When Tropical Storm Steve hit Saipan, the CNMI agencies were updating a plan to prevent and control storm water run-off. The agencies wanted to be sure they provided the most advanced pollution prevention plan possible.

From the data collected, the WERI meteorologists have now determined predictable cycles for severe storm rainfall levels. These cycles are called **return periods**. At the time of this book's writing, planners and engineers are now working to apply this new knowledge of rainfall return periods to the Commonwealth's stormwater management programs.

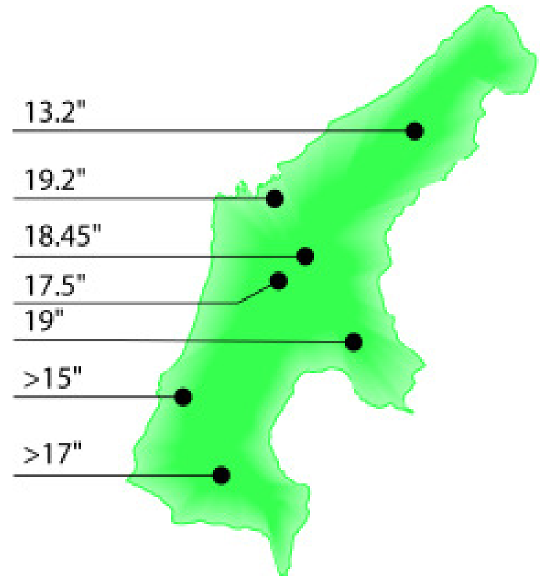
7. 4. 6. Our Expectable Rainfall Return Periods and their Importance

Planners and engineers use the maximum level of rain expected during a single day (24 hours) at certain yearly frequencies for their development of storm water management plans. As mentioned, this data is also used to determine proper culvert sizes.

After analyzing the data, WERI scientists now predict that a maximum rainfall event of four inches within 24 hours comes from a thunderstorm. Since each year we have thunderstorms, we now know that 4 inches equals our 1 year average 24 hour rain event.

So, if we can expect a storm that drops four inches of rain at least once every year, how often should we expect a storm that drops twice, four times, or even six times this amount?

Our once-every-two-years expectable maximum 24 hour rainfall amount is about 5 inches. Our 5-year maximum 24 hour rain event produces about 8 inches. Planners can anticipate that at



24-hour rainfall distribution at various locations on Saipan associated with the passage of Tropical Storm Steve, 3 August 1993.

Sediment laden storm-generated surface runoff

Dual culverts can often help mitigate heavy rainfall.

Any location on an island has the same chance of getting a typhoon-induced high rainfall level as any other location.

least once in every two years the run-off system must be able to control a 5 inch rainfall, and that once in every 5 years, it must manage a rainfall of 8 inches.

Typhoon core rains account for virtually all 24-hour rainfalls of more than 9 inches. This 9-inch rainfall corresponds to a return period of about 9 years.

The 10-year, 24-hour rainfall maximum is about 10 inches; the 20-year, 24-hour rainfall maximum is about 17 inches; the 25-year, 24 hour storm is 20 inches; and the 100-year, 24-hour maximum rainfall is 32 inches or more.

7. 4. 7. No Orographic Effect from Typhoon-Induced Rains

As mentioned above, the return periods of these heavy rainfall events are referred to as being *independent of location* on the islands. In other words, any location on an island has the same chance of getting a typhoon-induced high rainfall level as any other location. There is no orographic effect for typhoon-induced rains. This was a key finding that demonstrated the need to update our maps and regulations.

7. 4. 8. Our Need to Update Our Stormwater Control Regulations While Maintaining Adequate Environmental Protection

For development construction, engineers must design a system that is ready to deal with large amounts of run-off on an infrequent but effective basis.

Current earthmoving regulations require the control on each project's site of the 25 year, 24 hour storm for each land development. Overflow pipes could be allowed for storm levels over this amount but not for less than this amount.

The levels of stormwater applied under these environmental protection rules were enacted before the CNMI learned of the actual levels of these expectable storms. We now know that retention ponds able to hold that much water would likely use a great deal of most projects' development sites.

A workable stormwater management requirement is being sought by both developers and government officials to best apply the lessons learned to accommodate our development needs, while adequately protecting our coastal ecosystems.

7. 5. VIOLENT STORM SAFETY

7. 5. 1. Introduction

For our own protection and that of our loved ones, each of us should learn the rules of safety for violent storms. The rules are different for thunderstorms and typhoons because each has unique dangers.

In the following sections, we will first discuss the safety rules for thunderstorms. Then we will examine the different classes of *typhoon conditions*. Finally, we will survey precautionary procedures for protecting life and property under typhoon conditions.

7. 5. 2. Thunderstorm Safety

Thunderstorms are not very dangerous if we take the proper precautions. The most important rule for safety is that if lightning can be seen, do not stay outside in the open. Instead, get into a building or car for protection.

There are many other things that we can do to decrease our chances of being hurt during a thunderstorm.

*Stay away from doors, windows, and plugged-in electrical appliances.
*Outside, stay in the lowest part of the landscape, in dense brush, or in a dense grove of trees.
*Do not stand by tall single trees, buildings, or utility poles.
*Do not go into a cave.
*Do not go swimming or boating.

Thunderstorms move fast and are only a danger for a short time. If possible, get into a building or car during the storm. If these are unavailable, get as low as possible outside, and avoid tall trees and poles until the storm passes.

Boats are in particular danger from typhoons.

7. 5. 3. Typhoon Watches and Warnings

From August to December during our typhoon season, the Mariana Islands are always in Typhoon Condition 4. Here is an explanation of the four typhoon conditions:

Typhoon Condition 4 – Typhoon speed winds possible within 72 hours.
Typhoon Condition 3 – Typhoon speed winds possible within 48 hours.
Typhoon Condition 2 – Typhoon speed winds probable within 24 hours.
Typhoon Condition 1 – Typhoon speed winds almost certain within 12 hours.

7. 5. 4. Preparations and Advice for Before, During and After Typhoon Passage

The following are typhoon safety rules based on those of the American Red Cross. They should be followed for each typhoon. Typhoon advisories will help save our lives and those of our children if we take the right action.

1) — Enter each typhoon season prepared:
— Every August through March, recheck your household's supply of tools, batteries, nonperishable foods, water, emergency lights and stoves, first aid kits, storm shutters or plywood boards, concrete nails, and any other equipment needed when a typhoon strikes.

2) — When the first tropical storm advisory is heard:
— Continue listening for messages well before the issuance of **watches** and **warnings**. This is the best preparation for a typhoon emergency.

Roadways are often undercut by strong wave action.

The Joint Typhoon Warning Center, Guam.

Trees are often broken or denuded by typhoon winds.

3) — When the island is covered by a typhoon watch:

— Continue normal activities, but stay tuned to the radio or television for all Commonwealth Emergency Operations Center advisories.

— Remember: A typhoon watch means potential danger. If danger develops, a typhoon warning will be issued.

__ Meanwhile, keep alert. Ignore rumors.

— Track potential island-hitting storms using the map coordinates announced. If the latest announcement is missed, stay tuned to the station. Another announcement will be aired soon.

— Become familiar with how to use the Internet to track each season's storms. Track each storm in our vicinity.

— Additionally, the Commonwealth Emergency Management Center is available by phone for latest information on any nearby storm (322-8001, 2, 3-9274,-9529). If a typhoon is imminent, the Department of Public Safety will normally dispatch officers with loud speakers to village sites cautioning residents to seek shelter.

4) — When the island receives a typhoon warning and during the storm:

— Make a plan before the storm arrives and avoid a last-minute rush that can result in poor preparation.

— Women in their third trimester of pregnancy should weather the storm at a local hospital. They will be expecting you.

— Secure outdoor family pets by bringing each indoors if possible.

— Keep calm until the emergency has ended.

— Leave low-lying prone-to-flooding and coastal areas that may be swept by high tides, storm surges, or waves.

— Leave houses not constructed to typhoon standards. Go to shelters. Bring any needed family items, including bedding materials, food, water, disposable diapers, and flashlights.

— Board up windows or protect them with storm shutters and tape. Danger to small windows is mainly from wind-driven debris. Wind pressure and debris can easily break larger windows. Stay well clear of unprotected windows and pane glass doors.

— Secure outdoor objects that might be blown away. Garbage cans, garden tools, toys, signs, picnic tables, porch furniture, loose lumber or corrugated tin, and a number of other ordinarily harmless items, become dangerous in typhoon winds. Anchor them or store them indoors before the typhoon strikes.

— Store enough drinking water for three days in jugs, bottles, and cooking utensils. Outside water storage may become contaminated or damaged by the typhoon. Fill the bathtub with water for use in flushing the toilet.

— Check battery-powered equipment. A radio may be the only link with the world outside during the typhoon, and emergency cooking facilities, lights, and flashlights will be essential if utilities are interrupted.

— Keep cars fully fueled. Service stations may be inoperable. Stay at home only if the building is sturdy and on high ground. If it is not, move to a designated shelter when condition one is announced and stay there until the storm is over and an *all clear* is announced.

— Avoid cooking with open flames. Be extremely careful when using candles and closely monitor children's use of candles. Have them use battery lanterns instead if possible.
— Always remain indoors during the typhoon. Travel is extremely dangerous when winds with high tides are passing through an area.
— Monitor the storm's position using a battery-powered radio or home computer linked to the Internet.
— Avoid the eye of the typhoon. If the calm eye of the storm passes directly overhead, there will be a lull in the wind lasting from a few minutes to an hour or more. Stay in a safe place unless emergency repairs are absolutely necessary. Remember: At the other side of the eye the winds rise very rapidly to typhoon force, but come from the opposite direction.

5) — When the typhoon has passed:
— Seek necessary medical care at Red Cross disaster stations or hospitals.
— Stay out of disaster areas. The presence of people who are not qualified to help can hamper first aid and rescue work.
— Drive carefully along debris-filled roads.
— Avoid loose or dangling wires, and report them immediately to the Commonwealth Emergency Operations Center, CUC, or Public Safety. Also report broken sewer or water lines to CUC.
— Be absolutely careful with fires when cooking. Remember that lowered water pressure, caused by broken water pipes or power failures, may make fire-fighting difficult.
— Check refrigerated food for spoilage if power has been off during the typhoon.

If we take the above measures, we should be fairly safe during a typhoon.

Downed power lines are a serious public safety threat.