ARCHITECTURE

EHLINGER & ASSOCAITES FOURTH QUARTER 1993

SEASONS GREETINGS

The staff of Ehlinger & Associates extends Seasons Greetings to all of our friends who receive the Newsletter. Merry Christmas, Happy Hanukkah and Happy New Year!

ST. BASIL'S CATHEDRAL
MOSCOW, RUSSIA

St. Basil's Cathedral in Moscow is this issue's limited edition signed print by Ladd P. Ehlinger. The cathedral lies on the south side of Red Square at the west end where the trapezoidal (in plan) square narrows and fronts on the Moscow River. The Kremlin is to the north of the cathedral, the G.U.M. department store is to the south, and a museum is to the east.

There are some interesting "factoids" that should be discussed first, before the cathedral itself is discussed.

The name "Red Square" has a completely different connotation in Russian than it has in English. We have been taught by implication that the name *Red Square* was named for the *Red Communists*. This simply isn't true. The square was originally called *Krasnayov* in ancient Russian, which has two meanings: beautiful and red. The Russians understand it as *beautiful*. The name should have been translated into English as "Beautiful Square".

The Kremlin has always been understood by implication to be an *evil place*, the seat of the communists' government, a la President Ronald Reagan's description of the *evil empire*. Kremlin actually means fort in Russian. All ancient cities in Russia had a Kremlin, and they were the location picked for a last ditch defense in a war. The Kremlin in Moscow just happened to be the Tsar's Kremlin as well, containing palaces and multiple churches as well as the necessary governmental buildings.

St. Basil's was built by the Tsar in 1554, to celebrate a military victory over the Tatars, who had oppressed the Russians for centuries. Unlike other Byzantine churches of the Russian Orthodox Church, which are severe and almost depressing in appearance, St. Basil's is festive and celebratory in its forms and shapes and in its colors.

The cathedral has eight *onion* domes, peculiar bulbous shaped toppings, on top of cylindrical and octagonal drums with clerestory window lighting immediately under the masonry dome concealed within. In plan, St. Basil's has nine square bays in the form of a square, three each way. The sanctuary consists of three of the bays and is forbidden to all but the priests and male elders of the Church, and is separated from the remainder of the bays by a screen.

The Russian Orthodox Church worships icons. Icons are portraits of the Holy Family members or saints of the Church painted on wood and mounted in the masonry walls of the church inside and out, and on the sanctuary screen. The interiors of Russian Orthodox churches are severe and would be oppressive but for the icons. In any case, the interiors are very simple.

The *onion* domes are limited to Russian Orthodox churches. They are actually constructed of ribbed frames made of wood, similar to that of a ship, and sheathed in sheet metal that has been deformed and shaped to perform as shingles or like scales of a fish. These sheet metal panels overlap to become watertight. They are painted bright contrasting colors, such as red and green, blue and orange. Some are covered with gold leaf.

The friezes under the onion domes are fabricated of sheet metal as well, and are perforated to make an interesting shadow pattern.

Since the revolution in 1991, a wealthy person has purchased a number of churches, including St. Basil's, from the Russian government and donated them to the Russian Orthodox Church. Interestingly, little in the way of restoration has to be done to get these buildings back in service as churches, as the communist government maintained them beautifully along with all of the Tsar's palaces since 1917. Today, services are being held in churches all over Russia.

FIRE AND BUILDING CODES

The recent brush fires of thousands of acres in California remind us of how vulnerable we still are today to nature's oldest destructive scourge. While fire has a beneficial side to it, providing heat during cold weather, and heat for cooking and transforming materials to a different

desired state, it is the detrimental side of fire that we shall explore.

Man has invested an enormous amount of energy over the millennia learning about fire and taking protective measures to prevent fires and to limit the damage of fires once they start. Much of what has been learned has been incorporated into the buildings that we live in.

Fire is a chemical reaction. Oxygen combines with fuel under heat, producing more heat, light, and waste gases, transforming the physical shape or form of the element that has burned. Some materials burn more readily than others; it takes less heat to begin ignition or more fuel is contributed for the same amount of heat.

Much of what has been learned about structure fires to date has been incorporated into building codes to prevent or limit loss of life and damage to property as much as possible. Building codes are formed by a political process however, so some aspects of fire prevention have not been incorporated into codes because of political pressure. The typical building code balances the type and hazard of use of the building (called occupancy) against the type of construction (measured combustibility). The codes set rules and limits as to how much space may be constructed for a particular type of occupancy when constructed of a particular type of construction. It may prohibit a particular type of construction to be used to house a particular type of occupancy. These code dicta have a profound impact on the planning of the building that the Architect does.

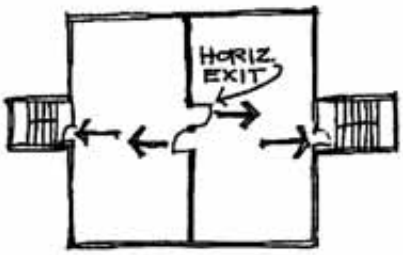
The occupancy of a building is usually classified as the predominant use of the building. It may be residential, office or business, educational, mercantile, industrial, etc. or the catchall for large groups of people, assembly. There may be mixed occupancy such as educational and assembly (where the assembly occupancy is secondary) or business and residential. What the codes prescribe to minimize the risk of various occupancies and mixed occupancies are the types of permissible construction (combustible, incombustible, sprinklered and/or protected) and the ratings of protection or separation, to separate the two occupancies by a wall of a rated fire resistance.

Ratings of fire resistance are determined by laboratory testing of the assemblage of materials that comprise the wall or building component, and are expressed in minutes or hours of protection or resistance to the defined laboratory fire. A wall may be classed or rated as a twenty minute wall, a one hour wall, a two hour wall, a three hour wall or a four hour wall. Similarly, the other components such as doors, windows, hardware, frames, etc. are rated by minutes and hours. No wall rating is higher than four hours, and this is typically defined as a fire wall. Fire walls are considered to separate spaces into entirely separate buildings.

Building codes also prescribe how many people per square foot of area for each particular type of occupancy to design for, how many inches wide of exits from the building per person, and how many stairs and inches wide of stairs per person to design for. The most common rule is that there shall be a minimum of two exits, at opposite farthest points in the building. In multiple level structures, that there shall be a minimum of two stairs at opposite farthest points in the building. This sounds like simple common sense, that one should have a second or alternate means of egress in the event that the fire blocks one, but in foreign countries it is uncommon. One encounters single, unenclosed stairs wrapped around open elevators in many hotels in Europe and in Mexico. In the U.S. it was not common to have two fire stairs until there were many deaths from people being trapped in burning buildings.

The code required stairs are directed by the code to be fire stairs; that is, enclosed with or separated by rated walls to prevent the spread of fire and smoke within the building, as the stair can also function as a chimney. Sometimes in high risk occupancies, such as hospitals, the stairways and elevator shafts are required to be pressurized with a positive pressure by fans powered by the emergency electrical system to prevent the intrusion of smoke.

Other planning devices are called for or allowed depending upon the occupancy. One interesting example is the horizontal exit. The floor of the building is divided into two portions by a two hour rated wall with at least a pair of 1-1/2 hour rated doors, each swinging in opposite directions. When considering each portion of the building, up to half the occupants of each portion of the building are considered to be able to exit into the other portion of the building. Therefore, fewer stairs or widths of stairs are required. The tradeoff, however, is that one is spending money on the rated wall and doors which define the area of refuge from the fire within the building.



Most codes allow a greater area of a particular type of construction for a given occupancy to be built when the structure is sprinklered. Experience has shown that buildings that are sprinklered have less loss of life and less damage by a very large factor. Sprinklers are also used or required by code authorities to compensate for unusual conditions that may be considered a risk. An example might be an interior atrium surrounded by a glass wall. The code would require that extra sprinklers be used around this wall.

Unfortunately, the political aspect of codes prevents the most dangerous type of occupancy and construction from being designed and constructed safely. Most deaths and injuries, and economic losses occur in single family detached residences. This building type has many hazardous functions within it such as cooking; and it typically is built of combustible materials (wood) and is unsprinklered. Most people do not want to spend the money for incombustible, rated construction or for sprinklers; yet their lives hang in the balance.