

**Fire Investigator Independent Study Continuing Education**  
**NFPA 921 (2004 Edition) UNIT #3**  
**NFPA 921 Guide for Fire and Explosion Investigations 2004 Edition**

**Objective:** Given an examination the participant shall demonstrate a knowledge and understanding of fire patterns.

**Reading/study assignment:** NFPA 921 Guide for Fire and Explosion Investigations, 2004 Edition, pp. 921-30 through 921-41 (Chapter 6, 6-1 thru 6.14.4)

**Study/reference questions:**

Why are fire patterns analyzed?

What are truncated cone patterns?

What can generate enough heat to melt metals?

As the velocity of the hot gas increases, is heat transfer by convection decreased, increased or unchanged?

What are heat patterns and how can they assist the investigator?

Do depth of char patterns differ with fuel gases and why?

What letter or letters of the alphabet are used to describe the shape of some fire patterns?

How do ignitable liquids effect spalling?

What type of change is the melting of a material?

What does spalling on the underside of ceilings mean?

What 6 truncated cone patterns are named?

What causes more pronounced effects of oxidation?

What materials does spalling usually affect?

Of what importance is spalling to the fire investigator?

What are the effects of oxidation?

What identifiable temperature in structure fires is referred to?

What effect does oxidation have on various metals?

What is the melting temperature range of common metals?

What does the presence of spalling indicate?

The melting of a material is what type of change?

What is the melting temperature range of thermoplastics?

How do melted materials assist the fire investigator?

What is the best way to utilize a specific melted material for a temperature indicator?

Why may spalled areas appear lighter in color?

How will oxidation affect rock and soil?

Study burn holes and holes in floors section in 6.3.3.2.

What is surface effect of char and how can the investigator use this?

As gases rise in a plume what cools them?

Areas of great damage are indicators of \_\_\_\_\_, \_\_\_\_, or \_\_\_\_\_. Are these always at the point of origin?

How may room ventilation affect pattern magnitude and location?

What kind of patterns can be generated by a hot gas layer?

What kind of patterns may be generated by full room involvement?

What effect may changing fire conditions have on fire patterns?

What effect does heat release rate have on fire patterns?

What can cause penetrations of horizontal surfaces?

What are some examples of patterns resulting from ventilation?

Fire patterns may be caused by \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, & \_\_\_\_\_.

How much difference is there in the flame temperatures of wood and gasoline?

How will broken tempered glass appear and where is tempered glass found?

What causes spalling?

What are the general indications of calcination?

What type fuels can form soot in their flames?

How do the flame temperatures of hydrocarbon and cellulosic fuels compare?

What are “effective fire temperatures”?

What are annealed springs?

What is fire rated gypsum wallboard?

What is alloying of metals?

What does the absence of spalling indicate?

How is alloying of metal confirmed?

What causes thermal expansion and deformation of materials?

What is calcination?

How does thermal expansion affect plastered surfaces?

What materials expand when heated?

What is the normal color of smoke condensate?

How can a depth of char diagram be produced?

How does alloying affect metals?

Why would no smoke or soot be present on some surfaces?

What has research determined in reference to fire and breaking of glass?

What is clean burn?

Are clean burn and spalling the same? Why or why not?

Patterns represent the history of the fire. What changes take place in reference to fuel and ventilation that may affect these patterns?

Are downward penetrations considered unusual? Why? What can cause them? How can you determine from which direction the penetration occurred? Can movement both upward and downward through the same hole occur during a fire and what should an investigator keep in mind in reference to this possibility? Does loss of material have any meaning to the investigator? What may this tell you?

Are victim injuries to be considered and what can they tell you in reference to burn patterns?

What can cause charring at the top and the bottom of a closed door?

What are the two basic types of fire patterns?

What are movement patterns and how can they assist the investigator?

What is surface effect and how can this change patterns?

What is wood char? What causes it? What happens to the char?

How can the investigator use depth of char in the investigation?

What are key variables in depth of char analysis and how do they affect depth of char?

What is a fire pattern?

What are intensity heat patterns and how may they be helpful?

What are lines of demarcation and what do they mean?

What should be used in measuring depth of char? Where should the measurements be made? What should the investigator consider when measuring depth of char?

Study "Interpretation of Char" 6.5.5.

What does rate of charring mean? What affects rate of charring? How can the investigator use this?

Study Figure 6.5.5.

What causes calcination and what are some of the progression indicators of calcination?

What are some of the variables that affect the condition of glass after fire?

When does progressive loss of strength of steel occur?

What may the staining of glass indicate for the fire investigator?

How will an impact break in glass look as compared to a break in glass caused by heat?

What is crazing?

How do the flame temperatures of hydrocarbon, cellulosic fuels and burning metals compare?  
What is spalling?

What causes crazing?

What variables affect depth of calcination analysis? Why?

What pressures are associated with a fire and at what pressure will glass windows break?

What is the melting temperature range of glass?

What can cause collapsed furniture springs?

How would you use comparative analysis with collapsed furniture springs?

What distance can glass travel as a result of an overpressure?

What other circumstances and effects may be considered when analyzing collapsed furniture springs?

What is oxidation?

Study Figures 6.12.5.2(a) and 6.12.5.2(b).

Study table 6.8.1.1