Report of the Committee on Rubber Tires

Stephen R. Hoover, Chair
Kemper Nat'l Insurance Cos., IL [I]

Robert C. Everson, Calabash, NC [SE]
James M. Ingalls, Industrial Risk Insurers, CT [I]
James E. Long, Michelin Tire Mfg., SC [M]
Robert A. Longbottom, The Goodyear Tire & Rubber Co., OH [M]
Rep. NFPA Industrial Fire Protection Section
Gerald W. O'Rourke, O'Rourke & Co., CA [SE]
Michael J. Rzeznik, Harrington Group, GA [SE]
James R. Schifiliti, Fire Safety Consultants, Inc., IL [SE]
Robert D. Spaulding, Factory Mutual Research, MA [I]
Jack Thacker, Allan Automatic Sprinkler Corp. of Southern California, CA [IM]
James R. Townhill, Piedmont Environmental Inc., NC [M]
Rep. General Tire
Robert B. Walker, Bridgestone/Firestone, Inc., TN [M]

Alternates
Joseph B. Hankins, Jr., Factory Mutual Research Corp., MA [I]
(Alt. to R. D. Spaulding)
Rich Kaiser, Star Sprinkler Corp., WI [IM]
(Alt. to J. Thacker)
Peter J. Pantuso, Rubber Mfrs., Assn., DC [M]
(Alt. to R. B. Walker)
Todd E. Schumann, Industrial Risk Insurers, IL [I]
(Alt. to J. M. Ingalls)
William P. Thomas Jr., Kemper Nat'l Insurance Cos., IL [I]
(Alt. to S. R. Hoover)

Edward Jefferson, Naugatuck, CT
(Member Emeritus)

Staff Liaison: Richard P. Bielen

This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the back of this document.

Committee Scope: This Committee shall have primary responsibility for documents on the safeguards against fire in the storage of rubber tires.

The Report of the Technical Committee on Rubber Tires is presented for adoption.

This Report was prepared by the Technical Committee on Rubber Tires and proposes for adoption amendments to NFPA 231D-1994, Standard for Storage of Rubber Tires. NFPA 231D-1994 is published in Volume 6 of the 1997 National Fire Codes and in separate pamphlet form.

This Report has been submitted to letter ballot of the Technical Committee on Rubber Tires which consists of 12 voting members. The results of the balloting, after circulation of any negative votes, can be found in the report.
231D-1 - (1-2, Table 4-1.2): Accept
SUBMITTER: Edward Kamiński, Schirmer Engineering
RECOMMENDATION: Delete text as follows:
1. 1-2 (Horizontal channel,...Such channels may be form
2. Rack...Racks may be fixed....
3. Table 4-12 Note 1...Actual testing and (in) should not be viewed as not a definitive....The authority having jurisdiction (shall) should use....
SUBSTANTIATION: These proposals revise NFPA 231D to eliminate nonmandatory language.
COMMITTEE ACTION: Accept.
The Committee has made some editorial corrections to the recommendation as follows: "form" should be "formed", "a" should not be struck through.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

231D-2 - (1-2 Bundled Tires and Figure 1-3(e)): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: Revise Section 1-2 Bundled Tires by changing "Bundled" to "Banded". Rest of the definition to remain the same.
In Figure 1-3(e) change "bundled" to "banded" and change "unbundled" to "unbanded".
SUBSTANTIATION: This is consistent with the change made in Committee Proposal 231D- (Log #CP6) with the change in the caption. Banded is used more than bundled.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

231D-3 - (Figure 1-3(f)): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: In Figure 1-3(f), revise the caption as follows:
"On-floor storage: on-tread, normally banded."
SUBSTANTIATION: The change of deleting "distance along tire holes not to exceed 25 ft (7.7 m)" was made to be consistent with the language in 3-1.1.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

231D-4 - (Figure 1-3(g)): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: The Committee on Rubber Tires is making the following corrections to NFPA 231D, Code for the Storage of Rubber Tires.
SUBSTANTIATION: Editorial.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

231D-5 - (2-1.2(a) and (b)): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: 1. Modify the second sentence of 2-1.2(a) as follows:
"Columns shall have a 1 hour fire resistance rating for the entire length of the column, or one sidewall sprinkler directed to one side of the column at a 15 ft (4.6 m) level."
2. Change the second sentence of 2-1.2(b) as follows:
"Column shall have a 2 hour fire resistance rating for the entire length of the column, including connections with structural members; or two sidewall sprinklers, one at the top of the column and the other at 15 ft (4.6 m) level, both directed to the side of the column."
SUBSTANTIATION: Fireproofing the entire column clarifies the intent of the requirement.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker
COMMENT ON AFFIRMATIVE: THACKER: My notes of the two day meeting indicate that the committee approved, that if and when column sprinklers are provided, their GPM is not additive to the sprinkler design density.

231D-6 - (2-1.2(b) Exception No. 2 (New)): Accept in Principle
RECOMMENDATION: Add new "Exception No. 2" to Section 2-1.2(b) as follows:
Exception No. 2: The above protection shall not be required where ESFR sprinkler systems approved for rubber tire storage are installed.
SUBSTANTIATION: The inclusion of ESFR sprinkler protection in the 231D Rubber Tire Storage Standard not addressed previously.
Two recent test programs entitled "Rubber Tires: Investigation of A Common Protection For Three Types of Storage" and "Protection Investigation of 25 ft High Rubber Tire Storages" were conducted in 1992 and 1996 in conjunction with the Factory Mutual Research Corporation and the Rubber Manufacturers Association produced data which demonstrated the ESFR sprinkler’s superiority over any other currently designed sprinkler for the protection of large scale tire warehousing of laced tires in open portable steel racks.
NOTE: Supporting Material is available for review at the NFPA Headquarters.
COMMITTEE ACTION: Accept in Principle.
Revise Exception to Section 2-1.2 to read as follows:
Exception: The above protection shall not be required where ESFR or large drop sprinkler systems approved for rubber tire storage are installed. Also revise the substantiation to include large drop sprinkler protection.
COMMITTEE STATEMENT: The committee added large drop sprinklers because the test series mentioned in the substantiation also pertains to large drop sprinklers. Also, this change is consistent with NFPA 231C.
This Exception is for 2-1.2 not 2-1.2(b) as stated by the submitter.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 2 O'Rourke, Walker
EXPLANATION OF NEGATIVE: INGALLS: It was my understanding that a second Exception was to be added as No. 2 to include ESFR and large drop sprinklers. It is necessary to retain existing Exception for in-rack sprinklers as No. 1. To rewrite as a single exception will need more work.
NFPA 231D — A98 ROP

COMMENT ON AFFIRMATIVE:

HOOVER: I believe we all agreed to add something about large drop sprinklers to the substantiation so that is what I show. Also removed the sentence about revising the substantiation from the Committee Action as we did not intend that comment to be part of the standard.

VOTE ON COMMITTEE ACTION:

231D-7 - (2-2.2): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: Modify 2-2.2 to read as follows:
“4-hour fire walls shall be provided between tire warehouse and tire manufacturing areas. Fire walls shall be designed in accordance with NFPA 221, Standard for Fire Walls and Fire Barrier Walls.”

SUBSTANTIATION: This change was made to make it more consistent with the fire wall requirements of other storage standards.

Also, the primary concern for fire walls is between manufacturing and warehouse areas and not between adjacent warehouse areas.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O’Rourke, Walker

231D-8 - (2-3 and A-2-3 (New)): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: Add a new Section 2-3* to read:
2-3* Travel Distance to Exits. Travel distance to exits in storage occupancies shall be in accordance with NFPA 101, Life Safety Code.

Add a new Section A-2-3 to read:

• Based on NFPA 101, Life Safety Code, criteria, tire storage would be classified as ordinary hazard.
• Tire fires begin burning slowly. In combination with an acceptable automatic sprinkler system, this allows time for egress.
• Tire storage warehouses have a low occupant load.
• Large aisle widths (8 ft minimum) required in Section 3-1.2 of this standard facilitate egress.

SUBSTANTIATION: Some local authorities are imposing travel distance requirements in tire storage warehouses based on old, outdated standards.

• The most recent Life Safety Code (NFPA 101-1994) more accurately reflects the intent of travel distance requirements (refer to supporting material submitted to NFPA). The language recommended above to be added to NFPA 231D was taken verbatim out of the Life Safety Code.
• There is an extremely low risk and incidence of indoor tire fires (due to good prevention/protection systems, and the difficulty of igniting tires).
• Tire storage warehouses have a low occupant load - generally less than 15 people out in the storage area away from the dock and office area, on mobile equipment.
• Large aisle widths (8 ft minimum) required in Section 3-1.2 of NFPA 231D also facilitate egress.
• To impose travel distance requirements of less than 400 ft is a poor use of capital/resources. This would require escape tunnels or the equivalent. For all of the reasons noted above, warehouse workers would not travel to the center of a warehouse center and use a tunnel when they could just as easily travel directly to an outside exit door. (Most likely, the one they used to enter the building, or the main dock.)
• The scope of NFPA 231D is not limited to fire prevention/protection issues. Thus, it is perfectly acceptable to address this life safety issue.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O’Rourke, Walker

231D-9 - (3-2.2): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: Change 3-2.2 to read:
“Storage clearance in all directions from roof structures shall be not less than 18 in. (45 m).”

SUBSTANTIATION: Modern construction methods have changed the mode of operation and storage arrangements.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O’Rourke, Walker

231D-10 - (3-3.2(c) and (d), 3-3.3 (New)): Accept in Principle
SUBMITTER: Stephen R. Hoover, William Thomas, Kemper Insurance
RECOMMENDATION: Add the words “outside or on-tread” between the words “storage” and “up” in both sentences.

Add a new Section 3-3.3 to say:
“Miscellaneous storage is within the scope of NFPA 13, Standard for the Installation of Sprinkler Systems”

SUBSTANTIATION: The original wording left the reader wondering if all tire storage on racks was acceptable or if there were any restrictions at all. The change clarifies the committee’s intent. The new paragraph also clarifies the committee’s intent by moving a statement from the appendix to the body of the standard.

COMMITTEE ACTION: Accept in Principle.

Accept the first recommendation as submitted.

Revised text of new 3-3.3 will now read as follows:
“Miscellaneous storage shall be protected in accordance with the requirements of NFPA 13, Standard for the Installation of Sprinkler Systems”

COMMITTEE STATEMENT: The wording of 3-3.3 was modified to make the statement a mandatory requirement.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O’Rourke, Walker

231D-11 - (3-4 (New)): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: Add new 3-4 as follows:
3-4 Mixed Storage.

• Protection in accordance with this standard is provided, stored tires shall be segregated from other combustible storage by aisles at least 8 ft (2.4 m) wide.

Delete 2-2.1 and replace
SUBSTANTIATION: The purpose of this standard is to provide a minimum level of protection and not endorse a lesser level of protection. Paragraph 2-2.1 was modified and moved to 3-4 since this section addressed mixed storage and not fire walls.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O’Rourke, Walker

231D-12 - (4-1.1): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: Modify 4-1.1 as follows:
“Automatic sprinklers shall be installed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, except as modified by this standard.”

SUBSTANTIATION: Large Scale Testing indicates differing performance criteria as indicated in NFPA 13 for ESFR sprinklers and this standard does not wish to imply that unprotected tire storage is acceptable.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O’Rourke, Walker

231D-13 - (4-1.1): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: Modify 4-1.1 as follows:
“Automatic sprinklers shall be installed in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, except as modified by this standard.”

SUBSTANTIATION: Large Scale Testing indicates differing performance criteria as indicated in NFPA 13 for ESFR sprinklers and this standard does not wish to imply that unprotected tire storage is acceptable.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O’Rourke, Walker
SUBMITTER: Stephen R. Hoover, William Thomas, Kemper Insurance

RECOMMENDATION: Add an entry for ESFR sprinklers as follows:

<table>
<thead>
<tr>
<th>Piling Method</th>
<th>Pipe Height</th>
<th>Number of Sprinklers and Minimum Operating Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubber Tire Storage</td>
<td>Up to 25 ft in a 50 ft Building</td>
<td>12 Sprinklers @ 50 PSI</td>
</tr>
</tbody>
</table>

COMMITTEE ACTION: Accept in Principle

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 11

CONSPECTUS: 1

NOT RETURNED: 2 O'Rourke, Walker

Explanation of Negative:

SPAULDING: Note 3 in Table 4-1.2 states that ESFR protection is expected to control rather than suppress the fire. The ESFR protection recommendation was based on the results of two large drop sprinkler (LDAS) tests. Although the LDAS tests were used as the basis for recommending ESFR protection, the assumption, in this case, should be that ESFR sprinklers will provide suppression, irrespective of the results of the LDAS tests. ESFR sprinklers will operate sooner (lower RTI and temperature rating) than the LDAS. Therefore, the result should be suppression rather than control.

Log #10

SUBMITTER: Garth W. Ponte, The Reliable Automatic Sprinkler Co., Inc.

RECOMMENDATION: Add text as follows:

The densities and areas provided in the table are based on fire tests using standard response, standard orifice (1/2 in. [12.7 mm]), and large orifice (1 1/2 in. [35.5 mm]) sprinklers. The use of extra large orifice (EXT) sprinklers shall be permitted where listed for such use, and where installed at a minimum operating pressure of 10 psi (69 kPa) [0.7 bar] and very extra large orifice (VELO) sprinklers shall be permitted where listed for such use and installed at a minimum operating pressure of 7 psi (48 kPa) [0.5 bar]. In buildings where "old style" sprinklers exist, discharge densities shall be increased by 25 percent. For use of other types of sprinklers, consult the authority having jurisdiction.

SUBSTANTIATION: A VELO Sprinkler can control fires at lower operating pressures than existing sprinklers allowed under this standard; which is an improved method of fire protection.

Attached is a copy of UL Listing Report 96NK25107 which details the results of testing this sprinkler had in full scale fire testing.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: This Proposal was rejected because there is no large scale testing to support adding this sprinkler to the protection requirements for tires. Also, the full scale test program, "Protection Investigation of 25 ft (7.6 m) High Rubber Tire Storage" by FMRC and the Rubber Manufacturers Association with Tire Storage at 25 ft (7.6 m) was inadequately protected by 5/8 in. orifice sprinklers discharging 0.75 gpm/ft² (30.6 L/min/m²).

Log #6
SUBSTANTIATION: The laced tire storage arrangement had never been tested before and was not addressed in NFPA 231D. In racks of construction other than steel, or at storage heights lower than 24 ft, adequate protection may be feasible but at the present time has not been proved by test.

COMMITTEE ACTION: Reject.

COMMITTEE STATEMENT: This issue was clarified as a result of full scale tests.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

COMMITTEE ACTION: Accept.

COMMITTEE STATEMENT: This change makes Table 4-1.2 consistent with 3-1.1.

RECOMMENDATION: 1. In Table 4-1.2, delete Note 4 and renumber notes.
2. Delete the reference to “Note 4” in Table 4-1.2(1)(c).
3. Change “N/A” in the Table to “Not Allowed”.

SUBSTANTIATION: This change makes table 4-1.2 consistent with 3-1.1.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

COMMITTEE STATEMENT: This issue was clarified as a result of recent full scale test using ESFR and large drop sprinklers clearly demonstrates the need for this change.

AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

RECOMMENDATION: 1. Revise the first sentence of 4-1.2 to read:

“Sprinkler discharge densities and areas of application shall be in accordance with Table 4-1.2 for 1/2”, 17/32”, and ELO (extra large orifice) sprinklers.”
2. Revise Table 4-1.2(2) as follows:

(1) Retain the dual density option as is;
(2) Revise the second option to read “0.75 with 1-hr fireproofing of roof and ceiling assembly”, “N/A”, “4000”;
(3) Delete the third option which presently reads “0.75”, “N/A”, “4000”.
3. Revise the first sentence of Note 2 of Table 4-1.2 to read:

“The densities...[17/32 in. (13.5 mm)], and extra large orifice (ELO) sprinklers.” The remainder stays the same.

SUBSTANTIATION: Reviewing the 1992 tire test series, on which the second option was based, indicated that smoke buildup was a major contributor to both fire control and the number of sprinkler operations (29 sprinklers). By the time the array was obscured by smoke all 29 sprinklers had operated. The steel temperature measured during the test was about 1080 F and raised concern. If the steel temperature had been measured 10 feet to the north of ignition (where the peak gas temperature was nearly 2000 F) it would normally have exceeded the 1180 F critical steel temperature which indicates a need for a density higher than the 0.60 first recommended COMBINED WITH fireproofing of the roof and ceiling assembly.

HOOVER: My notes show that we deleted Note 6 too, so I added that.

SPAULDING: Is recommendation 3 to change each entry of “N/A” in the table to “Not applicable” or is it to change the definition in the notes, which currently reads: “Note 6: N/A = Not Applicable” to “Note 6: N/A = Not Applicable”? My recommendation would be simply to change the definition in Note 6.


COMMITTEE STATEMENT: This proposal revises Table 4-1.2(b) as follows:

(1) Retain the dual density option as is;
(2) Revise the second option to read “0.75 with 1-hr fire resisting rating” and change “N/A” to “Not Allowed”. Text will now read as shown at the bottom of this page.

Do not Accept Part 3, "The densities...

<table>
<thead>
<tr>
<th>Piling Method</th>
<th>Piling Height (ft)</th>
<th>Sprinkler Discharge Density (gpm/ft²) (See Notes 1 and 2)</th>
<th>Areas of Application (ft²) (See Note 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) On-side</td>
<td>20 to 25</td>
<td>0.60 and</td>
<td>Ordinary Temp. (°F)  High Temp. (°F)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.90 (see Note 5); or</td>
<td>Not Allowed 5,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.75 with 1-hr fire resisting rating of</td>
<td>Not Allowed 5,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>roof and ceiling assembly; or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 2 O’Rourke, Walker

EXPLANATION OF NEGATIVE:

SPAULDING: Table 4.1.2(b) of this Proposal indicates that the protection is appropriate for buildings up to 32 ft (9.8 m). As stated in the substantiation, the table was added based on a test program called “Protection of 25 ft (7.6 m) High Rubber Tire Storages” by FMRC and the Rubber Manufacturers Association. The tests were conducted in a building with a floor to ceiling height of 30 ft (9.1 m). The recommendation to increase the building height should not be accepted because: 1. there is no data to substantiate the recommendation and 2. extrapolation of fire test data beyond storage or building heights tested is not reliable. Without sufficient data there is no reliable method of determining if the extrapolated recommendation will result in an uncontrolled fire.

COMMENT ON AFFIRMATIVE:

HOOVER: Editorial again but the “5” telling the reader where Note 3 applies was missing so I added it where I think it belongs.

THACKER: Footnote should be labeled (see note...) to be consistent with the standard.

---

Table 4.1.2(b) Large Drop Sprinklers(1)

<table>
<thead>
<tr>
<th>Piling Method</th>
<th>Pile Height</th>
<th>Number of Sprinklers</th>
<th>Maximum Building Height</th>
<th>Duration</th>
<th>Hose Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubber Tire Storage</td>
<td>Up to 25 ft (7.6 m)</td>
<td>15 Sprinklers @ 75 psi</td>
<td>32 ft</td>
<td>3 hours</td>
<td>500 gpm (1892 L/min)</td>
</tr>
<tr>
<td>On-side or on-tread in palletized portable racks, or open portable racks or fixed racks without solid shelves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Wet systems only.

Note 2: Sprinkler operating pressures and number of sprinklers in the design are based on tests in which the clearance was 5 ft to 7 ft (1.5 m to 2.1 m) between the sprinkler deflector and the maximum height of storage. The authority having jurisdiction should be consulted where clearances exceed 7 ft (2.1 m).

Note 3: The design area shall consist of the most hydraulically demanding area of 15 sprinklers, consisting of 5 sprinklers on each of 3 branch lines. The design shall include a minimum operating area of 1200 ft² (111.5 m²), a maximum of 1500 ft² (139.4 m²) and utilize a high temperature rated sprinkler.
NFPA 231D — A98 ROP

Table 4-1.2(c) ESFR Sprinklers (1,4)

<table>
<thead>
<tr>
<th>Piling Method</th>
<th>Pile Height</th>
<th>Maximum Building Height</th>
<th>Number of Sprinklers and minimum operating pressures (2,3)</th>
<th>Duration</th>
<th>Hose Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rubber tire storage on-side or on-tread in palletized portable racks, open portable racks, or fixed racks without solid shelves</td>
<td>Up to 25 ft (7.6 m)</td>
<td>30 ft (9.1 m)</td>
<td>12 sprinklers @ 50 psi</td>
<td>3 hours</td>
<td>500 gpm (1892 L/min)</td>
</tr>
<tr>
<td></td>
<td>Up to 25 ft (7.6 m)</td>
<td>35 ft (10.7 m)</td>
<td>12 sprinklers @ 75 psi</td>
<td>3 hours</td>
<td>500 gpm (1892 L/min)</td>
</tr>
<tr>
<td></td>
<td>Up to 25 ft (7.6 m)</td>
<td>30 ft (9.1 m)</td>
<td>20 sprinklers @ 75 psi (5)</td>
<td>3 hours</td>
<td>500 gpm (1892 L/min)</td>
</tr>
</tbody>
</table>

Note 1: Wet systems only.
Note 2: Sprinkler operating pressures and number of sprinklers in the design are based on related tests in which the clearance was 5 ft to 7 ft (1.5 m to 2.1 m) between the sprinkler deflector and the maximum height of storage. The authority having jurisdiction should be consulted where clearances exceed 7 ft (2.1 m).
Note 3: The shape of the design area shall be in accordance with NFPA 13.
Note 4: Where used in this application, ESFR protection is expected to control rather than suppress the fire.

Comment 2: In Table 4-1.2(c) of this Proposal, ESFR sprinklers are recommended for the protection of rubber tires in a building to a maximum height of 35 ft (10.7 m). As stated in the substantiation, the table was added based on test program called "Protection of 25 ft (7.6 m) High Rubber Tire Storages" by FMRC and the Rubber Manufacturers Association. The tests were conducted in a building with a floor to ceiling height of 30 ft (9.1 m) not 35 ft (10.7 m). The recommendation to increase the building height should not be accepted because: 1. There is no data to substantiate the recommendation and 2. Extrapolation of fire test data beyond storage or building height tested is not reliable. Without sufficient data, there is no reliable method of determining if the extrapolated recommendation will result in an uncontrolled fire.

Comment 3: Table 4-1.2(c) recommends that 20 ESFR sprinklers at 75 psi be used to protect laced tires. The tests used for this recommendation resulted in 14 sprinklers operating. It is recommended that the criteria for protection be based on a safety factor of 1.5 times the operating area of the sprinklers with that result rounded up to the nearest square area. Although the test results are clearly positive, I recommend that this method be used because: 1. It is consistent with other NFPA recommendations when designing protection recommendations for high challenge fire and sprinklers and 2. This recommendation is based on the results of one test. With only one test, the recommendation should be based on a conservative rather than a liberal protection requirement, irrespective of the test results.

COMMENT ON AFFIRMATIVE:
HOOVER: Editorial but the "3" for Note 3 was in the wrong place and I moved it to where it applies.
THACKER: See comment on Proposal 231D-21 (Log #CP2) in regards to footnotes. Footnote (3) should be relocated after 12 sprinklers @ 50 psi and 12 sprinklers @ 75 psi.

231D-23 - (Table 4-1.2(c) (New)): Accept in Principle
RECOMMENDATION: Add new Table 4-1.2(c) as shown at the bottom of this page
SUBSTANTIATION: To add ESFR sprinklers protection for 25 ft high laced tire storage in open portable steel racks to the protection requirements which have not been previously addressed. Two recent test programs entitled "Rubber Tires: Investigation of A Common Protection For Three Types of Storage" and "Protection Investigation of 25 ft. High Rubber Tire Storages" were conducted in 1992 and 1996 in conjunction with the Factory Mutual Research Corporation and the Rubber Manufacturers Association produced data which demonstrated the ESFR sprinkler's superiority over any other currently designed sprinkler for the protection of large scale tire warehousing of laced tires in open portable steel racks.
NOTE: Supporting Material is available for review at the NFPA Headquarters.
COMMITTEE ACTION: Accept in Principle.
COMMITTEE STATEMENT: See Committee Proposal 231D-22 (Log #CP4). The Committee changed the submitters recommendation from 18 sprinklers to 20 sprinklers as an additional safety factor.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 9
NEGATIVE: 1
NOT RETURNED: 2 O'Rourke, Walker

Table 4-1.2(c) ESFR Sprinklers

<table>
<thead>
<tr>
<th>Piling Method</th>
<th>Pile Height</th>
<th>Number of ESFR Sprinklers and minimum operating pressures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laced tires in open portable steel rack [see Figure 1-3(g)]</td>
<td>Up to 25 ft (7.6 m)</td>
<td>18 Sprinklers @ 75 psi, 155 F Rated (517.5 kPa)</td>
</tr>
</tbody>
</table>

Note 1: Wet systems only.
Note 2: Sprinkler operating pressures and number of sprinklers in the design are based on tests in which the clearance was 5 ft (1.5 m) between the sprinkler deflector and the maximum height of storage. The authority having jurisdiction should be consulted where clearances exceed 5 ft (1.5 m).
Note 3: The design area shall consist of the most hydraulically demanding area of 20 sprinklers, consisting of 5 sprinklers on each of 4 branch lines. The design shall include a minimum operating area of 1600 ft² (148.6 m²)
EXPLANATION OF NEGATIVE:

SPHAULDING: Table 4-1.2(2) recommends that 18 ESFR sprinklers at 75 psi be used to protect laced tires. The test for this recommendation resulted in 14 sprinklers operating. I recommend that the criteria for protection be based on a safety factor of 1.5 times the operating area of the sprinklers with that result rounded up to the nearest square area. Although the test results are clearly positive, I recommend that this method be used because: 1. It is consistent with other NFPA recommendations when designing protection recommendations for high challenge fires and sprinklers. 2. This recommendation based on the result of one test. With only one test, the recommendation should be based on a conservative rather than a liberal protection requirement, irrespective of the test results.

231D: 24 - (4-1.3.1): Accept
SUBMITTER: Paul Roberto, Wausau Insurance Companies
RECOMMENDATION: Delete entire paragraph 4-1.3.1.
SUBSTANTIATION: This paragraph limits maximum discharge pressure of sprinklers to 60 psi. No explanation for this limit is provided in this standard. NFPA 231C currently contains the same requirement with the explanation that the highest pressure in the test program was 62.5 psi. With the introduction of new sprinkler heads and results from large scale fire testing, it is clear that head pressures in excess of 60 psi will not only be desirable, but will be required in some situations. Some current NFPA standards have protection requirements for end head pressures exceeding 60 psi and/or very high density requirements for which a 60 psi maximum may unnecessarily restrict design options (spacing, sprinkler k-factor, etc.). NFPA 13, 231, 231E and 231F currently contain no such maximum pressure limit.

COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

231D: 25 - (4-1.4.1): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: In Section 4-1.4.1 change "4-1.4" to "+41.4.2"
SUBSTANTIATION: Editorial.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

231D: 26 - (4-1.4.2): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: Delete Section 4-1.4.2 in its entirety and renumber accordingly.
SUBSTANTIATION: Installation of in-rack sprinklers is adequately covered by NFPA 231C.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker
COMMENT ON AFFIRMATIVE:
THACKER: I believe 4-1.4.2 should remain since NFPA 231C does not mandate in-rack sprinklers to be 2 ft 0 in. from rack uprights nor does it mandate clearance below in-rack sprinklers in all storage scenarios and when it does, it is 6 in., not 4 in.

231D: 27 - (4-2.1): Accept
SUBMITTER: Technical Committee on Rubber Tires
RECOMMENDATION: Revise Section 4-2.1* to read as follows: "When only automatic sprinkler protection is specified in Table 4-1.2(a) it is acceptable to reduce densities to one-half the densities specified or 0.24 gpm/ft², whichever is higher, and install a properly designed high expansion foam system in accordance with NFPA 11A, Standard for Medium- and High-Expansion Foam Systems.

SUBSTANTIATION: This change clarifies the intent of combination sprinkler/foam systems.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12
VOTE ON COMMITTEE ACTION:
AFFIRMATIVE: 10
NOT RETURNED: 2 O'Rourke, Walker

231D - 28 - (4-3.2(c) Exception No. 2 (New)): Accept in Principle
RECOMMENDATION: Add new "Exception No. 2" to Section 4-

231D: 29 - (Appendix C): Accept in Principle
SUBMITTER: Michael Blumenthal, Brady Williamson, Waddell Hill, Scrap Tire Mgmt Council.
RECOMMENDATION: Revise text to read as follows:
Appendix C Guidelines for Outdoor Storage of Scrap Tires
C-1 Scope. This appendix applies to the outdoor storage of scrap tires in whole, baled, or processed form, including incidental usage locations.
C-2 Purpose. This appendix has been developed for the purpose of aiding fire officials and authorities having jurisdiction in their effort to both prevent and properly manage fire incidents that occur in whole, baled or processed scrap tire stockpiles. Each individual property has its own unique conditions of fire handling, exposure, and topography. Thus, in this appendix, basic fire protection principles are applied with due consideration of local factors.

Rubber has a heat combustion of about 15,000 Btu per pound, and roughly twice that of ordinary combustibles (e.g., paper and wood). Once ignited, fire development is rapid, and high temperatures can be expected due to the large exposed surface area of whole tires. In the case of baled or processed tire fires high temperatures can also be expected although the fire behavior will differ. Burning is likely to persist for extended periods of time. In all cases there is a high probability of rekindling in the tire pile even if the fire is controlled.
C-3 Definitions.
Burn-it (F): A fire fighting strategy that would allow for the free-burn of a tire fire.
Bury-it (F): A fire fighting strategy that suggests burying a tire pile with soil, sand, gravel, cement dust or other cover material.
Concrete (A): A composite material that consists essentially of a binding medium within which are embedded particles or fragments of aggregate, in hydraulic cement concrete, the binder is formed from a mixture of hydraulic cement and water.
Forecasting. The ability to predict the fire progression location prior to the completion of the inventory fire break using heavy equipment.
Scrap Tire (ST): A tire which can no longer be used for its original purpose, due to wear or damage.
Shredded Tire (ST): A size reduced scrap tire. The reduction in size was accomplished by a mechanical processing device, commonly referred to as a "shredder".
Tactics (F): The method of securing the objectives laid out in the strategy through the use of personnel and equipment to achieve optimum results.
Tire Chip (ST): A classified scrap tire particle that has a basic geometrical shape, which is generally two inches or smaller and has most of the wire removed (also refer to Chipped Tire).
C-4 Fire Experience. Fire experience in outdoor storage of scrap tires reveals a number of concerns, including lack of fire codes for scrap tire storage; the generation of large amounts of black smoke; the fact that the storage is often too close to buildings on the same or adjacent premises, which causes fires in these exposed buildings; the generation of oil during a fire where the oil contributes to the fire or where the runoff contaminates the surrounding area; delays in reporting fires; and the lack of fire-fighting capabilities. The fire hazards inherent in scrap rubber tire storage are best controlled by an aggressive fire prevention program that includes a pre-incident plan.
C-5 General Fire Prevention. The fire hazard potential inherent in scrap rubber tire storage operations can best be controlled by a pre-incident plan. The method of storage should be solid piles in an orderly manner and should include:
(a) Fire lanes to separate piles and to provide access for effective fire-fighting operations should be a minimum of 40 ft wide in accordance with Table C-4-2.3;
(b) Separation of yard storage from buildings, vehicles, flammable materials, and other exposures should be a minimum of 200 ft;
(c) The area within 200 ft of pile should be totally void of trees, plants or vegetation;
(d) Topography will be a factor in the manner of tire fire tactics and environmental mediation.
(e) Tires should not be stored on wetlands, flood plains, ravines, canyons or on steeply graded surfaces. Scrap tire storage preferably should be on a level area. The preferred surface for the storage area is concrete or hard packed clay, not asphalt or grass;
(f) Smoking should be prohibited within the tire storage area. Other types of potential ignition sources such as cutting and welding, heating devices, and open fires should be prohibited. Suitable safeguards should be provided to minimize the hazard of sparks from such equipment as refuse burners, boiler stacks, and vehicle exhaust.
(g) Piles should not be permitted beneath power lines or structures.
(h) Lightning protection systems, conforming to local and state codes, should be placed on the facility, but away from the tire piles.
(i) Piles should be at least 50 ft from the fences; lanes should be kept clear of debris or vegetation;
C-6 Fire Department Access to Site. Each tire storage yard should be provided with fire access routes:
(a) Each tire storage yard or pile should be provided with emergency vehicle access routes, such that no portion of the pile is more than 150 ft from an access road or fire break;
(b) All roads and accesses should be designed to support the loads imposed by fire fighting equipment.
(c) All bridges and structures, including drainage structures on access roads, should be capable of carrying a minimum design load of HS-20 per American Association States Highway Transportation Officials AASHTO "Standard Specifications for Highway Bridges". The design and as-built plans for all bridges should be certified by a licensed structural engineer; routes should be surfaced with material designed to permit accessibility under all climatic conditions;
(d) All emergency vehicle accesses should have unobstructed vertical clearance of no less than 13 ft 6 in., or as is needed to allow for passage of large fire fighting equipment with a minimum outside turning radius of 45 ft should be provided for emergency vehicle access.
(e) All dead-end accesses in excess of 150 ft long should be provided with a turn-around area;
(f) Accesses should be well-maintained and remain accessible to the fire department at all times, and; the fire chief may allow the use of alternative materials or processes to provide equivalent fire protection.
C-7 Site Security. Appropriate steps should be taken to limit access to the tire storage area:
(a) The facility should have a chain link fence at least 10 ft high with intruder controls on top (in accordance with local laws);
(b) There should be gates protecting each access point (a minimum of one on each side), that can be locked when the facility is not open for business;
(c) All gates should have a 20 foot open width and remain unobstructed at all times;
(d) Gates should have rapid entry design compatible with local fire department requirements.
(e) Gates should have an optimum activation system or equivalent and a compatible system approved by the local government. All electrically activated gates should have default capabilities to the unlocked position;
(f) A certified security attendant or site manager should be on site at all times when the facility is open;
(g) Clearly visible signs with business hours and regulations should be posted near the facility entrance.
C-8 Pre-Incident Planning. Pre-increment plans are developed by fire departments too identify special features and hazards at a particular site or property and specify the department operational plan. Pre-increment plans are specific to a location; analytical forecasting of types of emergencies that may be encountered complement the readiness efforts that are generally employed to manage emergency incidents.
C-9 Pre-incident Planning. Pre-increment plans are developed by fire departments too identify special features and hazards at a particular site or property and specify the department operational plan. Pre-increment plans are specific to a location; analytical forecasting of types of emergencies that may be encountered complement the readiness efforts that are generally employed to manage emergency incidents.

It is strongly recommended that the fire department adopt a model incident management system that is published, taught to all members and regularly utilized. Neighboring (mutual aid) departments and outside agencies with whom the department must interact should be familiar with the department's model incident management system. Operational drills at the scrap tire facility involving mutual-aid companies and related agencies will be useful in evaluating shortfalls in the department's response capability and fire ground effectiveness.
A thorough survey of the area under the jurisdiction of the fire department should be undertaken to detect the existence of scrap tire piles. In many areas the piles are remotely and illegally dumped. Once the areas have been surveyed and the existence of scrap tire piles identified, the magnitude of the problem should be
assessed and an appropriate fire prevention methodology developed.

Topographical maps and detailed area plot plans should be compiled, noting all features of the terrain and property, hydrants and water supply sources, accesses, interior lanes or passages and fuel load configuration.

Ingress and egress plans should be developed for apparatus and equipment. The development of additional access points, pre or post incident, should be analyzed and planned and the means of maintaining or expanding accesses provided.

Incident emergency contact personnel lists (names, addresses and multiple telephone/pager numbers) for the facility, appropriate agencies, contractors, mutual aid agreements, etc should be obtained. These lists should be updated on a semi-annual basis.

A water supply usage plan with estimated gallons per minute requirements should be developed.

G9 Water Supplies. A public or private fire main and hydrant system should be provided. A water system should be provided to supply a minimum of 1,000 gpm (3,780 L/min) for less than 20,000 units storage (50,000 cu ft), or 2,000 gpm (7,560 L/min) for 20,000 units or more for a duration of 6 hours.

If there is access to a lake, stream, pond, or other body of water in the vicinity of the storage area, a fire department suction connection should be provided.

C10 Pile Geometry and Spacing. Maximum pile height should be 20 ft (6 m), pile width 50 ft (15 m), and length should not exceed 250 ft (76.2 m) without a separation according to Table C-10. (See Figure C-10.)

250 ft Max.

50 ft Max.

Distance per Table C-10

Tire Pile

Tire Pile

Distance per Table C-10

Tire Pile

Distance per Table C-10

Building

Figure C-10.

The separation distances in Table C-10 were calculated using NFPA 80A, Recommended Practice for Protection of Building Exterior Fire Exposures, Chapter 2. The percentage of openings in the exposing wall area were considered to be 100 percent, and the severity of the exposing fire was considered severe. The height of exposing fire from burning tires was considered as 1.5 times the height of the tire pile since flames extending above the burning tires contribute to the size of the radiation surface area. In accordance with NFPA 80A, the height of the exposing fire equals the building height. The height of combustibles stored within the building is not covered; it depends on the severity of the exposure fire. A comparative building height would have to exceed the height of piling by several feet at least, and it could be substantially higher. Furthermore, the height (and width) of flames above a fire-penetrated roof would be substantially influenced by the debris of the fire-damaged or collapsed roof, whereas flame height above yard storage would have no such restriction.

The width limitation of 50 ft means that as the exposed face exceeds 100 ft the pile takes on the appearance of a "wind row," and there is little likelihood that the entire face would be burning at one time. Thus, in Table C-10 the minimum exposure separation distances are held constant for exposed face dimensions greater than 100 ft.

For 500 units or less, the minimum separation between scrap rubber tires and structures should be 25 ft (7.6 m) or as reduced by Chapter 3, "Means of Protection," and Chapter 4, "Application of Means of Protection," of NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.

For More than 500 Units.

In order for storage piles to be considered isolated piles, the minimum separation distance between piles should be in accordance with Table C-4.2.3.

The width of the exposing fire should be taken as the combined width of piles facing the exposed building, disregarding the nominal separation between piles provided by narrow access aisles and roadways.

Because of the extensive fire expected in scrap tire storage, some form of exposure protection for adjoining properties should be considered. If the clear space as recommended in Table C-10 cannot be provided, provide a dirt berm 1.5 times the height of the tire storage or other protection meeting the requirements of the authority having jurisdiction.

When baled tires are stored the storage should be vertical rather than horizontal. Under fire conditions the bands release allowing for sudden, drastic movement of burning tires.

C11 Outdoor Tire Pile Fire Fighting Tactics and Strategy. The guidelines contained in this appendix are based upon the collective experiences of fire service professionals who have managed major scrap tire fires and are presented as an adjunct to the strategic and tactical practices of an incident command system.

Conventional fire suppression tactics are ineffective for scrap tire fires. Fire fighting tactics and strategies for suppression of fires in whole tires versus processed tires differ. The unique shape of whole tires allows the storage of enough air to support combustion throughout the pile and it is difficult to reach all the burning surfaces. Because of these complications tire fires can continue for weeks, and even months despite aggressive fire suppression tactics.

The foundation of fire suppression should be based upon the data collected before the fire. With an established pre-incident plan utilizing a model incident command system, decisions regarding size-up, tactics, strategies, and overhaul can be resolved quickly. Familiarity with what has worked historically in tire fires throughout the country will also aid in the decision making process. These decisions should be based upon your understanding of the dynamics and behavior of a tire fire.

<table>
<thead>
<tr>
<th>Table C-10 Representative Minimum Exposure Separation Distances</th>
<th>Tire Storage Pile Height (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposed Face</td>
<td>10</td>
</tr>
<tr>
<td>25</td>
<td>55</td>
</tr>
<tr>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>250</td>
<td>100</td>
</tr>
</tbody>
</table>
The environmental consequences of all suppression techniques should be evaluated carefully. Communications between the incident commander and on-scene environmental specialist is critical.

Tactics/Strategies for Whole Tire Fires. Important tactical considerations include protecting exposures, separating burning tires from the rest of the inventory, and forecasting. Forecasting for an effective location for separation should include arrival time of equipment and time necessary to develop the needed fire break. Heavy equipment can be used to accomplish these tasks.

Protection of exposures will be an important tactical decision.

The initial approach to a tire fire should begin with isolating the tire inventory from the fire. Creating fire breaks in a large scrap tire pile is a long and consuming process. But it can be accomplished with heavy machinery and front end loader.

Bulldozers, front-end loaders, and similar equipment may be permitted to be used to move tires not yet involved in the fire, to create breaks in the tire pile, or to cover burning tires with soil.

Equipment breakdown—scrap tires caught between the wheels, tracks, and undercarriage of heavy equipment—have been reported. Firelines should be deployed to provide protection to operators and equipment alike.

Recognized strategy options are:

Let-it-burn
Bury-it
Drown-it.

Let-it-burn. Letting a tire pile burn has its merits. Factors influencing this decision includes but not limited to, level of fire involvement, resources available, location of the fire, environmental and economic impact.

Soil and water pollution as well as the clean-up costs may be drastically reduced when many of the products of combustion are consumed.

A precedent for the let-it-burn strategy appears in fire responses to chemical fires.

The fire service must manage and control the burn process. Protecting exposures and separating tires from the burn area will still be a tactical priority.

Bury-it. The decision to bury a tire pile also has merits. Materials as diverse as the soil on site, cement kiln dust, sand, gravel, and even crushed coral have been employed to cover the burning material.

The bury-it strategy could be employed in areas that have minimal water supply or in areas that densely populated. The decision to bury a tire fire should take into consideration reducing the toxic smoke for the sake of public health.

Geological considerations play an important role in the bury-it strategy. While the tire fire is entombed, tires can pyrolize and oil can be generated and released into the soil or underground water sources.

Drown-it. The drown-it strategy is best employed with forethought and careful pre-planning. Knowing in advance the topography, having the water supply available, and exposure hazards to above ground water sources will be critical. Planning for the control and containment will facilitate this tactic.

The drown-it strategy also has some drawbacks. Cooling the fire will increase the air emissions as the combustion process is slowed down. An inordinate amount of water runoff combined with pyrolitic oil can result form the drown-it tactic.

Tactics/Strategies for Processed Tire Fires.

Important tactical considerations include protecting exposures, separating burning tires from the rest of the inventory, and forecasting. Heavy equipment can be used to accomplish these tasks.

To effectively combat this type of fire, a fogging application of water or other fire retardant should be applied. Cooling the plane of fire should put the fire out. Using a mist will also reduce the amount of water used, and the subsequent run-off that may be generated.

Under no circumstances should a processed tire pile be broken open or doused with streams of high pressure water, directed into the piles. Water actually increases the severity and duration of the fire by introducing oxygen into the pile and by breaking up the pile, causing the fire to burst into flames and emit incompletely burned hydrocarbons and other contaminates to the atmosphere.

Once the surface fire is put out, the cooled chips should be removed, allowing water or fire retardant to reach under layers that are hot and still burning. This process should be repeated until chips are no longer smolder or hot.


Add References under Other Publications.


SUBSTANTIATION: The modifications to Appendix C were done to update and clarify the previous appendix material. Many of the changes are based on research and actual field experience. The proposed changes to Appendix C provides details to the existing and sound guidelines found the appendix.

A scope and purpose statements were added to include baled and processed tires and to introduce the new material into the appendix.

General Fire Prevention, Fire Department Access, Site Security and Pre-Incident Planning were modified and based on the "Guidelines for the Prevention and Management of Scrap Tire Fires" developed jointly by the International Association of Fire Chiefs and the Scrap Tire Management Council. Tire piles were prohibited beneath powerlines and structures as a result of a real fire beneath a bridge.

The water supply section was modified by increasing the 3 hr duration to 6 hr because experience and historical fire fighting tactics have shown that this new time duration is effective. The change in number of units are consistent with the new tire pile size geometry.

Existing section C-4, Exposure Protection was retitled to Pile Geometry and Spacing. The pile geometry was modified based on fire fighting experience which indicated that this new configuration allowed for both a storage pile and acceptable radiant flux level. The minimum exposure separation distances were left unchanged for exposed face dimensions of 100 ft or less. For exposed faces greater than 100 ft, the separation distances were held constant because of real fire fighting experience shows that with a 50 ft tire pile width no more than 100 ft of the pile face is burning at one time. Many of these changes were based on the paper "Fire Safety Assessment of the Scrap Tire Storage Methods," by Robert Brady Williamson, Ph D and Robert Allen Schroeder, MS presented at the INTERFLAM "96", March 26-28, 1996 at St. John's College, Cambridge England.

The new section on Outdoor Tire Pile Fire Fighting Tactics and Strategies for both whole tires and processed tires is new information based on the "Guidelines" mentioned above. The information on processed tires is new information that has not been previously addressed.

New definitions and references were added as needed. COMMITTEE ACTION: Accept in Principle.
Forecasting. The ability to predict the fire progression location prior to the completion of the inventory fire break using heavy equipment.

Scrap Tire: A tire which can no longer be used for its original purpose, due to wear or damage.

Shredded Tire: A size reduced scrap tire. The reduction in size was accomplished by a mechanical processing device, commonly referred to as a "shredder".

Tactics: The method of securing the objectives laid out in the strategy through the use of personnel and equipment to achieve optimum results.

Tire Chip: A classified scrap tire particle that has a basic geometrical shape, which is generally two inches or smaller and has most of the wire removed.

C-5 General. The fire hazard potential inherent in scrap rubber tire storage operations can best be controlled by an aggressive fire prevention program. The method of storage should be solid piles in an orderly manner and should include:

(a) Fire lanes to separate piles and to provide access for effective fire-fighting operations should be in accordance with Table C-10;

C-10 Pile Geometry and Spacing. Maximum pile height should be 20 ft (6 m), pile width 50 ft (15 m), and length should not exceed 250 ft (76.2 m) without a separation according to Table C-10. (See Figure C-10.)

Delete the second paragraph of C-10, "The separation distances..."

500 Tires or Less. The minimum separation between scrap rubber tires and structures should be 25 ft (7.6 m) or as reduced by Chapter 3, "Means of Protection," and Chapter 4, "Application of Means of Protection," of NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.

In C-11, delete "Let it burn", "Bury-it" and "Drown-it" the first time it appears as a list (immediately after "Recognized strategy options are:");

Let-it-burn. Letting a tire pile burn has its merits. Factors influencing this decision includes but not limited to, level of fire involvement, resources available, location of the fire, environmental and economic impact.

COMMITTEE STATEMENT: Editorially revised with corrections to references and tables.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 12

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 10

NOT RETURNED: 2

O'Rourke, Walker

COMMENT ON AFFIRMATIVE:

HOOVER: This will probably take the Public Comment but misinterpret the first sentence of C-10 when I read it. My interpretation is that — I must have a 20 ft pile height, 50 ft width, and 250 ft length if my separation is less than specified in Table C-10; but if I comply with Table C-10 I can then exceed one or all of the pile dimensions. I think we should end the first sentence after "...exceed 250 ft (76.2 m)." Then add a second sentence to the effect, "Pile separation should be in accordance with Table C-10 and Figure C-10."

Figure C-10 Pile geometry and spacing.

Table C-10 Representative Minimum Exposure Separation Distances

<table>
<thead>
<tr>
<th>Tire Storage Pile Height (ft)</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>16</th>
<th>18</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>56</td>
<td>62</td>
<td>67</td>
<td>73</td>
<td>77</td>
<td>82</td>
<td>87</td>
</tr>
<tr>
<td>50</td>
<td>75</td>
<td>84</td>
<td>93</td>
<td>100</td>
<td>107</td>
<td>113</td>
<td>118</td>
</tr>
<tr>
<td>100</td>
<td>100</td>
<td>116</td>
<td>128</td>
<td>137</td>
<td>146</td>
<td>155</td>
<td>164</td>
</tr>
<tr>
<td>150</td>
<td>100</td>
<td>116</td>
<td>128</td>
<td>137</td>
<td>146</td>
<td>155</td>
<td>164</td>
</tr>
<tr>
<td>200</td>
<td>100</td>
<td>116</td>
<td>128</td>
<td>137</td>
<td>146</td>
<td>155</td>
<td>164</td>
</tr>
<tr>
<td>250</td>
<td>100</td>
<td>116</td>
<td>128</td>
<td>137</td>
<td>146</td>
<td>155</td>
<td>164</td>
</tr>
</tbody>
</table>

1. Separation distances are based on the paper "Fire Safety Assessment of the Scrap Tire Storage Methods," by Robert Brady Williamson, PhD and Robert Allen Schroeder, MS.

Note to editor: Add the reference to "Fire Safety Assessment of the Scrap Tire Storage Methods" to Appendix D.