



HAWAII INSURANCE BUREAU, INC.

July 22, 2016

FIRE AND ALLIED CIRCULAR

HIB Publication 160035

APPROVAL NOTICE

Re: **FIRE AND ALLIED FILING 2016-03**
2012 and 1980 Fire Suppression Rating Schedule (FSRS), and Hawaii Supplement

APPROVAL

On June 29, 2016 the Hawaii Insurance Division approved HIB's rule filing of the 2012 and 1980 Fire Suppression Rating Schedule, and Hawaii Supplement.

REFERENCES

Fire and Allied Filing FA 2016-03
FA 160028 (Advance Circular)

ABOUT THIS FILING

This filing provides the details as to how HIB will determine the Public Protection Classifications (PPC) by using the 2012 Fire Suppression Rating Schedule (FSRS). The current PPC grades will remain in place until HIB re-grades the communities. Therefore, the 1980 FSRS was re-filed to represent those past gradings. Members who subscribe to this line of insurance always have access to the final PPC grades by logging on to our website at www.hibinc.com.

It is the opinion of the Hawaii Insurance Division that HIB members' rating plans are incomplete without the FSRS which is used to derive the PPC manual. This filing will satisfy the Hawaii Insurance Division's requirement.

CAUTION

Members and subscribers wishing to adopt this filing must advise the:

Insurance Division, State of Hawaii
Department of Commerce and Consumer Affairs
P.O. Box 3614
Honolulu, HI 96814

Fire and Allied Circular 160035
July 22, 2016
Page Two

CAUTION *continued*

or SERFF is available.

and use the attached Reference Filing Adoption Form.

INFORMATION

If you have any questions about this subject, please contact our Customer Service Department at:

Tel: (808) 531-2771,
Fax: (808) 536-3516, or
e-mail: customerservice@hibinc.com

Attachments

INSURER FILING ADOPTION OF
HAWAII INSURANCE BUREAU, INC. (HIB)
SUPPLEMENTARY RATING INFORMATION

DATE: _____



1. INSURER NAME _____
ADDRESS _____

PERSON RESPONSIBLE FOR FILING: _____

TITLE: _____ TELEPHONE: () _____

2. INSURER NAIC #: _____

3. HAWAII INSURANCE BUREAU, INC. REFERENCE FILING:

FIRE AND ALLIED FILING 2016-03

**Fire Suppression Rating Schedule 2012 and 1980, and Hawaii Supplement
AL-2012-FSRS**

4. The above insurer hereby declares that it is a member, subscriber or service purchaser of the Hawaii Insurance Bureau, Inc., for this line of insurance.

5. PROPOSED EFFECTIVE DATE: _____

6. ATTACHMENT (if required, refer to Insurer Action)

Signature

Date

Please file with the Insurance Division, State Of Hawaii, Department Of Commerce
And Consumer Affairs. If filing by hard copy, send two copies to: P.O. Box3614,
Honolulu, HI 96811-3614

Include a SASE. If filing electronically, SERFF is available.
Please include the \$50 filing fee.

Revision to the Fire Suppression Rating Schedule (FSRS)

Applicable Lines of Business

This filing applies to the following lines of business:

- Commercial Property
- Businessowners
- Homeowners
- Dwelling Property
- Farm
- Personal Inland Marine

About This Filing

ISO evaluates municipal fire protection efforts in communities throughout the United States through the application of the Fire Suppression Rating Schedule (FSRS). The FSRS evaluates the key elements of a community's fire suppression system, which include:

- fire department,
- emergency communications, and
- water supply capabilities.

Over time, changes in technology, methods of operation and advanced fire suppression techniques have been incorporated into modern day fire suppression operations. Further, the fire service community has placed greater emphasis on nationally recognized fire protection standards. This filing updates and modernizes the FSRS to:

- reflect the current recognized and accepted standards developed by national standards organizations;
- recognize utilization of advanced technology and best practices in fire mitigation; and
- confirm the predictive capability of the evaluation process and classification structure.

Background

To survey a given community, ISO applies the Fire Suppression Rating Schedule which produces Public Protection Classifications (PPCs). The PPC program evaluates the importance of critical areas of fire protection:

- Fire department - adequacy of equipment, staffing levels, evaluation of training, existence of automatic aid, and geographic distribution of fire companies.
- Emergency communications - 911 telephone systems, adequacy of telephone lines, operator supervision and staffing, and the dispatching hardware and software systems.
- Water supply - condition and maintenance of hydrants, existence of alternative water sources, and an evaluation of the amount of available water - in volume and pressure - compared with the amount needed to suppress fires.

Based on the total number of points accumulated under the FSRS, the program assigns an advisory PPC classification from 1 to 10. Class 1 generally represents exemplary fire protection and Class 10 indicates that the community's fire protection program does not meet ISO's minimum criteria.

ISO's property insurance programs incorporate PPC classifications as a rating element. These PPC classifications are also available for insurers to use in their own ways to reflect differing levels of public fire suppression capabilities.

Introduction

Through the application of the FSRS, ISO has gained valuable experience over years of field work conducting countrywide PPC gradings. In addition, ISO has received input on the program from a variety of sources, which include various fire, water and emergency communication associations. ISO's outreach extended to over 50 national, state and local associations involved in fire protection, including, for example, the National Fire Protection Association (NFPA), International Association of Firefighters (IAFC), American Water Works Association (AWWA) and National Academies of Emergency Dispatch (NAED).

As a result of this experience and feedback, ISO is revising the FSRS to update and modernize the Schedule. ISO conducted actuarial and statistical analyses to assure that the FSRS continues to meet its goal as an objective insurance rating tool that is predictive of property losses.

Overview

The existing structure of the FSRS has been revised to:

- update existing provisions;
- incorporate references to recognized national standards, such as those adopted by the NFPA, AWWA and Association of Public-Safety Communications Officials-International (APCO);
- include changes to the weighting of existing sections; and
- add new sections that recognize community efforts to reduce losses through Fire Prevention, Public Fire Safety Education and Fire Investigation.

The core categories in the revised FSRS and the total credit points assigned to each of the major categories remain unchanged:

- Fire Alarm (Now "Emergency Communications"): 10 points
- Fire Department: 50 points
- Water Supply: 40 points

Within these categories, the content and focus of individual 'Items' (now referred to as 'Sections') has been revised, and the point weights adjusted.

A new category, "Community Risk Reduction", has been added to provide up to 5.5 extra credit points. The new category includes:

- Fire Prevention Codes and Enforcement
- Public Fire Safety Education
- Fire Investigation

Rate Level Effect

The application of the revised FSRS, which incorporates nationally recognized consensus standards, data analysis and decades of practical engineering experience, will be implemented on a community-by-community basis throughout the country. There will be no change in ISO loss costs as a result of this revision to the FSRS.

Attachments

- Section A - High-Level Description By Section of Significant Changes to the FSRS
- Section B - Change in Weights/Points Assignment
- Section C - Actuarial Support

Copyright Explanation

The material distributed by Insurance Services Office, Inc. is copyrighted. All rights reserved. Possession of these pages does not confer the right to print, reprint, publish, copy, sell, file or use same in any manner without the written permission of the copyright owner.

Important Note

Insurance Services Office, Inc. (ISO) makes available advisory services to property/casualty insurers. ISO has no adherence requirements. ISO rules and explanatory materials are intended solely for the information and use of ISO's participating insurers and their representatives, and insurance regulators. Neither ISO's general explanations of rules intent nor opinions expressed by members of ISO's staff necessarily reflect every insurer's view or control any insurer's application of manual rules.

Section A: High Level Description by Section of Significant Changes to the FSRS

Each section of the FSRS has been revised to update existing provisions, to delete obsolete items and to include reference, where applicable, to nationally recognized standards developed by expert organizations. Further, based on extensive actuarial research, changes were made to the points assigned where actuarial analysis indicated such points should be increased or decreased. A chart indicating the changes in points for each item is included as Section B.

While the entire Schedule has been rewritten and updated, many of the changes are editorial in nature. The following is a brief description of the substantive changes to the FSRS:

Chapter I Public Fire Prevention and Suppression

Section 100 - Introduction

Section 103 – Fire Protection Area

The word "City" was replaced with the more generic term "Fire Protection Area" to reflect the rapidly evolving and expanding civil subdivisions that are consolidating fire suppression services.

Section 105 – Calculations

This Section was clarified to indicate that credit is limited to 75% of the points possible when only partial documentation of an item exists. When no documentation of an item exists to substantiate an item being reviewed, no credit will be given unless otherwise stated.

Section 106 – Reference Standards

This Section was added to specify that whenever it is necessary to refer to a reference document (e.g. National Fire Protection Association Standards), it is referring to the latest edition of the reference document.

Section 200 – Schedule Application

Section 201 - Application:

- Section 201A1 was changed to increase the minimum pump capacity from 250 gpm to 750 gpm for Class 1-8.
- Section 201B1 was changed to increase the minimum pump capacity from 250 gpm to 750 gpm for Class 8B.
- Section 201C1 was changed to increase the minimum pump capacity from 50 gpm to 250 gpm for Class 9.

- Section 201C1 was changed to reduce the minimum size of the water tank from 300 gallons to 200 gallons on the frontline pumper used for Class 9.
- Section 201C3 was added to increase the minimum amount of water from 300 gallons to 500 gallons that needs to be delivered for Class 9.

Overall, the revisions to minimum criteria in Section 201 are expected to have a minimal effect on community classifications, as they reflect current standards in place in most communities.

Section 300 - Needed Fire Flow

Section 301 - Automatic Fire Sprinkler Systems

Section 301 was added to provide the method to calculate Needed Fire Flow (NFF) - the amount of water that should be available to provide fire protection for a selected location - for commercial buildings recognized by ISO as sprinklered, as well as other buildings not recognized as sprinklered but for which evidence exists that a sprinkler system is installed and maintained.

Section 310 - Construction Factor:

- A definition of Effective Area has been added.
- This Section was revised to indicate that buildings constructed in two or more Construction Classes shall be defined as a single Construction Class as determined by the ISO Specific Commercial Property Evaluation Schedule (SCOPEs) "Classification Of Mixed Construction".

NOTE: SCOPEs is used by ISO to establish hazard relativities and advisory loss costs for specific eligible properties. It provides the underlying factors that ISO uses to evaluate building construction, occupancy hazard relativities, protection credits and exposure for these specific risks.

Section 320 - Occupancy Factor

This Section now specifies that buildings that contain multiple occupancies shall have their occupancy expressed as a single occupancy classification as determined by SCOPEs "Combustibility Classification Applicable to Buildings".

Section 330 - Exposure and Communications:

- Section 330 was amended to modify the formula related to exposure with adjacent buildings.
- Tables 330A and 330 B have been modified to be consistent with SCOPEs.

Section 340 - Calculation of Needed Fire Flow:

- This Section was revised to add automatic sprinkler system recognition for dwelling and residential occupancies.
- The fire flow duration for single family dwellings has been reduced to one hour.
- An exception was added to allow the NFF formula to be applied for large one- and two-family dwellings.

Section 400 - Emergency Communications

Section 400 - General (Formerly Receiving and Handling Fire Alarms)

We have renamed "Receiving and Handling Fire Alarms" to "Emergency Communications". There is a shift in emphasis to a performance-based standard.

Section 410 - Emergency Reporting (formerly Telephone Service):

- This Section includes wire line or wireless telephone and other electronic reporting means. The emphasis was changed to an evaluation of the type of Basic or Enhanced 9-1-1 system used to take emergency calls and the level of sophistication of the system in regard to its ability to handle differing types of calls.
- The criteria for the number of needed emergency and business lines, call progression, telephone directory listing and the recording device was eliminated.

Section 420 - Telecommunicators (formerly Number of Needed Operators)

This Section evaluates the primary responsibilities of receiving, processing and disseminating public safety information via telecommunications devices. Added emphasis was put on telecommunicator training and certification including continuing education and quality assurance. Additional credit is applied if the dispatch center has adopted the use of standard emergency dispatch protocols including pre-arrival instructions for fire.

Section 430 - Dispatch Circuits:

- Credit has been added for an Uninterruptible Power Supply (UPS) when used in combination with an automatically-started or manually-started emergency generator.
- The credit for dispatch recording facilities at the communications center has been eliminated.

Section 500 - Fire Department

Section 507 - Automatic Aid:

- This Section was added to clarify that Automatic Aid is a consideration throughout the Fire Department evaluation rather than, as under the current schedule, addressed separately under each section. In addition, a description of the requirements for application of Automatic Aid was included.
- The calculation of an Automatic Aid factor has been changed to increase the maximum credit allowable.

Section 510 - Engine Companies:

- The determination of additional needed engine company locations has been eliminated.
- Weighting has been decreased from 10 points to 6 points to reflect a shift in emphasis from the number of apparatus and the equipment carried, to the placement of those apparatus (performance-based standards).

Section 511 - Number of Existing Engine Companies

Minimum pump capacity has been increased from 250 gpm to 750 gpm for at least one in-service pumper in accordance with the applicable NFPA standard.

Section 512 - Equipment on Existing Engine Companies:

This Section has been revised as follows:

- Pump capacity and hose capacity minimums for individual pumper credit have been revised to bring the requirements closer to those specified by the applicable NFPA standard while retaining the relationship with the hydrant distance required by the FSRS.
- The equipment tables have been re-formulated, to reflect only equipment that is outlined in the current edition of NFPA 1901.
- The equipment tables have been moved to Appendix A.

Section 523 - Credit for Reserve Pumpers

The analysis for reserve pumpers has been changed to credit actual reserve apparatus, in the same manner that is applied to in-service apparatus.

Section 540 - Ladder/Service Companies:

- The determination of additional needed ladder/service company locations has been eliminated.
- Weighting has been decreased from 5 points to 3 points to reflect a shift in emphasis from the number of apparatus and the equipment carried, to the placement of those apparatus (performance-based standards).

Section 542 –Equipment on Existing Ladder, Engine-Ladder, Service, Engine-Service Companies

- The equipment tables have been re-formulated, to reflect only equipment that is outlined in the current edition of NFPA 1901.
- The equipment tables have been moved to Appendix A.

Section 553 - Credit for Reserve Ladder and Service Trucks

The analysis for reserve ladder and service trucks has been changed to credit actual reserve apparatus, in the same manner that is applied to in-service apparatus.

Section 560 - Deployment Analysis (formerly Distribution of Companies):

- This section now considers the placement of engine and ladder/service companies with respect to their ability to protect the area they serve.
- This section now states that an alternative to a road mile distribution study is permitted. A deployment analysis based upon the results of a systematic performance evaluation can be used if it meets the appropriate criteria. This is expected to result in an increase in credit for those communities which can demonstrate response performance in accordance with national standards.
- Weighting has been increased from 4 points to 10 points to reflect a shift in emphasis from the number of apparatus and the equipment carried, to the placement of those apparatus (performance-based standards).

Section 570 - Existing Company Personnel:

- Section 570A - On-Duty Firefighters at Fire Stations (formerly On-Duty Strength):

This section was revised to clarify the definition regarding who and when firefighters are to be considered as On-Duty. Also included are Chief Officers and administrative personnel and the situations in which they may be included.

- Section 570B - Public Safety Officers (PSO):
 - ◇ A separate credit is established under Company Personnel for Public Safety Officers (PSOs), such as law enforcement officers or water department employees.
 - ◇ Qualifying criteria were added to cover basic guidelines for recognizing PSOs on the basis of the average number of members responding on the initial alarm (first alarm) to structure fires. PSOs are credited on a 2:1 ratio.

- Section 570C - On-Call and Off-Duty Firefighters (formerly Call and Volunteer Members):

A clarification was added to indicate that volunteer firefighters may be considered as On-Duty when assigned to a station according to a pre-set schedule.

- Section 570D - Automatic Aid Response:

The available credit was expanded for firefighters responding from qualifying automatic aid departments not credited as existing companies, when they respond on the initial alarm to structure fires.

Section 580 - Training

This Section was revised to:

- Add reference to the national standards to provide direction and guidance to the fire service on what constitutes adequate records.
- Qualify that credit for training is for structure fire-related subjects only.
- Reduce the number of hours of company training from 20 to 16 hours per member per month.
- Separate the evaluation and credit for training that is conducted at a training facility from that conducted at a fire station or when using streets, buildings and open areas.
- Reduce the required frequency of pre-fire planning from semi-annual to annual.

Section 600 - Water Supply

Section 613 - Main Capacity

This Section was amended to add the option to credit the results of a properly balanced and tested hydraulic water system model in lieu of actual fire hydrant flow test results.

Section 614 - Hydrant Distribution:

This Section was revised to:

- Increase the maximum credit for each standard hydrant within 1000 feet of the NFF from 1,000 gpm to 1,500 gpm in accordance with national standards.
- Eliminate the crediting of different hydrant distribution values based on the hydrant's distance from the NFF building for simplification and uniformity.

These changes are expected to result in no change in credit for most communities, and a minimal increase in credit for those communities where hydrant distribution is currently deficient.

Section 620 - Hydrants - Size, Type and Installation

Deductions were eliminated, due to a lack of measurable impact on fire suppression capability, for different direction of operation; different hose threads and different operating nuts.

Section 630 - Inspection and Fire Flow Testing of Hydrants (formerly Inspection and Condition of Hydrants):

- Section 630A - Inspection:
 - ◇ Points for inspection frequency and completeness were modified.
 - ◇ The deduction for lack of inspection records was revised to allow for no credit for inspections that are not recorded.
 - ◇ The minimum credit for inspections that are completed with a frequency of 5 years or more was eliminated.
- Section 630B - Fire-Flow Testing:
 - ◇ The credit for evaluation of a Fire-Flow Testing program is new and follows the guidance of the AWWA and NFPA standards. This item is intended to incent good fire protection policy by allowing credit for a periodic fire-flow testing program.
 - ◇ The ability to credit the flow prediction results of a properly installed and calibrated hydraulic water system model, in lieu of a comprehensive fire-flow testing program, was added.
 - ◇ Credit for a hydrant marking program was included.

Section 700 - OPERATIONAL CONSIDERATIONS

Section 700 - General

This new section reviews fire department Standard Operating Procedures (SOP) and Incident Management Systems for emergency operations involving structure fires.

Section 710 - Credit For Standard Operating Procedures:

- This section provides credit for the establishment of SOP's for fire department structure fire operations.
- The reviewed items are limited to SOP's having a direct relationship with the Fire Suppression Rating Schedule.

Section 720 - Credit For Incident Management System

This section provides credit for the establishment of an Incident Management System.

Section 1000 - Community Risk Reduction (Newly Added Section)

Section 1020 - Fire Prevention Code Adoption and Enforcement:

This section assesses the Fire Prevention Code adoption and enforcement capabilities of a community. Fire Prevention Code and Enforcement is based on:

- Adoption and maintenance of one of the model codes.
- The number and qualifications of fire prevention personnel, including certification and continuing education.
- Activities of the Fire Prevention Programs, including: plan review, certificate of occupancy inspections, quality control, code compliance, inspection of private fire protection equipment, fire prevention ordinances, and coordination with fire department training and pre-incident planning activities.

Community Risk Reduction will reference NFPA 1, *Fire Code* and ICC International Fire Code as appropriate model codes. Full credit for adoption of codes will be available if the community has adopted the latest edition. Lesser credit will be available for earlier versions.

This Section specifies that sufficient Fire Prevention Inspectors are needed to perform fire prevention inspections on all nonresidential structures at least once a year. State or county fire prevention inspectors, as well as fire suppression personnel who perform in-service fire prevention inspections, may be considered as Fire Prevention Inspectors. Certification and training of Fire Prevention Inspectors are evaluated in this Section.

Activities of the fire prevention programs will be reviewed, including: plan review, certificate of occupancy inspections, quality control, code compliance, inspection of private fire protection equipment, fire prevention ordinances, and coordination with fire department training and pre-incident planning activities.

Section 1030 - Public Fire Safety Education:

This section appraises the Public Fire Safety Education capabilities of a community. Public Fire Safety Education is based on:

- The existence of a fire safety education program.
- Qualifications and training/certifications of public fire safety educators.
- Activities of the various Public Fire Safety Education Programs, including: residential fire safety programs, fire safety education in schools,

juvenile firesetter education programs and fire safety education in occupancies with large loss potential or hazardous conditions.

Section 1040 - Fire Investigation:

This section examines the Fire Investigation activities of a community and is based on:

- Establishment of authority to conduct and enforce fire investigations.
- The number and qualifications of fire investigators.
- Activities of the fire investigation staff.
- Use of the National Fire Incident Reporting System.

The number of fire investigators for full credit must be sufficient to investigate all structure fires and may include fire investigators with authority from the state fire marshal's office or the county or other civil jurisdiction.

Credit for use of the National Fire Incident Reporting System is based on satisfactory reporting for the three years before an evaluation.

Section 1100 - Total Credit And Classification

Section 1101 - Public Protection Classification

The Public Protection Classification formula was adjusted to reflect the revised FSRS.

Section 1200 - Class 8B Protection

Section 1201 - Class 8B Protection Criteria:

- **Section 1201A - Emergency Communications:**

The minimum number of points for Emergency Communications needed to qualify for Class 8B has been reduced.
- **Section 1201B - Fire Department:**

Emphasis was changed from a relative class 6 fire department grading to having adequate equipment to respond.
- **Section 1201C - Water Supply:**

The scope of areas covered by the minimum fire flow was revised to require that the fire department must deliver the minimum water supply to the entire buildable area within 5 miles of the responding fire station in order to qualify for Class 8B.

Section 1300- Class 9 Protection

Section 1310 - Class 9 Protection Criteria

Section 1310A - Personal Protective Clothing is a new Section, included to encourage safe firefighting practices. Each person credited must have available to them, while on the fireground, a protective clothing ensemble meeting the general criteria as referenced in the national standards.

Section 1312 - Class 9 Classification

Several changes were made to the equipment list, to reflect equipment items outlined in NFPA 1901, *Chapter 6-Initial Attack Fire Apparatus*.

Chapter II Individual Property Fire Suppression

Section 2102 - Evaluation of Fire Department Companies

In Section 2102B the maximum potential credit for automatic aid engine and ladder companies and automatic aid engine-ladder companies was increased.

Section 2311 - Public Protection Classification for an Individual Property

The revised Schedule clarifies that the Public Protection Classification for an individual property located in an area classified as Class 8B shall be Class 9, due to water supply limitations.

Section B - Change in Weights/Point Assignment

CURRENT FSRS			REVISED FSRS		
RECEIVING AND HANDLING FIRE ALARMS CURRENT SCHEDULE			EMERGENCY COMMUNICATIONS REVISED SCHEDULE		
Item	Description	Max Points	Section	Description	Max points
414	Telephone Service	2	414	Emergency Reporting	3
422	Operators	3	422	Telecommunicators	4
432	Dispatch Circuits	5	432	Dispatch Circuits	3
440	Fire Alarm Total	10	440	Communications Total	10
FIRE DEPARTMENT CURRENT SCHEDULE			FIRE DEPARTMENT REVISED SCHEDULE		
Item	Description	Max Points	Section	Description	Max points
513	Engine Companies	10	513	Engine Companies	6
523	Reserve Pumps	1	523	Reserve Pumps	0.5
532	Pump Capacity	5	532	Pump Capacity	3
549	Ladder/Service Co.	5	549	Ladder/Service Co.	4
553	Reserve Ladder/Service	1	553	Reserve Ladder/Service	0.5
561	Distribution of Companies	4	561	Deployment Analysis	10
571	Personnel	15+	571	Personnel	15+
581	Training	9	581	Training	9
590	Total Fire Department	50+	730	Operational Considerations	2
			590	Total Fire Department	50+
WATER SUPPLY CURRENT SCHEDULE			WATER SUPPLY REVISED SCHEDULE		
Item	Description	Max Points	Section	Description	Max points
616	Supply System	35	616	Supply System	30
621	Hydrant Size, Type and Installation	2	621	Hydrant Size, Type and Installation	3
631	Hyd. Inspection & Condition	3	631	Inspection & Fire Flow Testing of Hyds	7
640	Total Water Supply	40	640	Total Water Supply	40
[REDACTED]			ADDITIONAL ITEMS REVISED SCHEDULE		
			Section	Description	Max points
			1000	Community Risk Reduction	5.5
				Total Additional Items	5.5
TOTAL POINTS-CURRENT SCHEDULE		100+	TOTAL POINTS-REVISED SCHEDULE		105.5+

Section C - Actuarial Support

This section contains the actuarial analyses in support of the revision to the Fire Suppression Rating Schedule

Data Used

The analyses presented in this document are based on Commercial Property and Homeowners experience. The Commercial Fire loss analysis is based on experience reported under the Commercial Statistical Plan (CSP) from 2006 to 2010, in ZIP code level detail. The Homeowners analyses are based on two separate sources of experience. The first is experience reported to ISO under the Personal Lines Other Than Auto Statistical Plan (PLSPOTA) from 2003 to 2010, in ZIP code level detail. The analyses also utilize data with address-level detail from partner insurance companies representing approximately 12% of the market. This data is available at the individual address level for policy years 2000 – 2004.

Overview of Analysis

The current FSRS assigns up to 100 points to a community based on a detailed inspection and review. These points are distributed as follows:

Fire Department - 50 points

Water Supply - 40 points

Alarm and Communication - 10 points (now Emergency Communications)

This point structure underlies both the current and the revised FSRS. An analysis comparing different weightings found no better alternative to this 50-40-10 weighting scheme.

Based on this 100-point scale, a community will be graded from 1 to 10 --- with the grade of 1 being the highest. Each 10-point interval is associated with a different grade (90-100 is Grade 1; 80-89 is Grade 2; 70-79 is Grade 3; etc.). This grade is referred to as the Public Protection Classification (PPC).

There are a number of individual items that underlie the points for Fire Department, Water Supply, and Alarm and Communication. Each item has a certain point value, with the total of the points from all items yielding the overall grade. Details of the underlying items are found in the revised Schedule attached to this filing.

The actuarial analysis examined the actual loss experience in each community, and compared that experience to the community's grade. ISO used the average claim severity (dollars of insured loss per claim adjusted for construction code, Limit of Insurance, etc.) divided by the amount of insurance (in \$thousands). We refer to this quantity as the Average Fire Severity (called "Avg Sev"). Effectively, we examined the size of insured losses for individual claims. By relating this to the size of the amount of insurance in \$000's, we were able to adjust for the wide range of insured building values.

The various analyses examined the Average Fire Severity for various communities, and compared this to the points assigned to that community by the Schedule. We expect to see that the average severity decreases as the points assigned by the FSRS increase. Ideally, this relationship should hold when the Fire Department points, Water Supply points, and Alarm and Communication points are examined separately.

Results of Analyses

The following graphs display a number of analyses. Each graph presents a comparison of the Average Fire Severity to the Points assigned by the Current and Revised Schedules. Results are presented for the Overall Total Points in the Schedules, as well as for the Fire Department, Water Supply and Alarm portions separately. For each comparison, results of analyses of Commercial Property and Homeowners are separately presented.

Results for both the current FSRS and the revised FSRS are both presented in the following graphs. For the "protected" communities (PPC 1-8) the communities are grouped into quartiles, where communities in progressively higher quartiles have earned a larger number of schedule points. For example "min - p25" refers to the bottom 25% of communities (within classes 1-8). Communities in PPC 9 and PPC 10 (the "unprotected" communities) are separately displayed.

Overall Schedule Result

The following graphs display a comparison of the Average Fire Severity to the Total Points assigned by the Schedule. The results for the current Schedule and the revised Schedule are both presented.

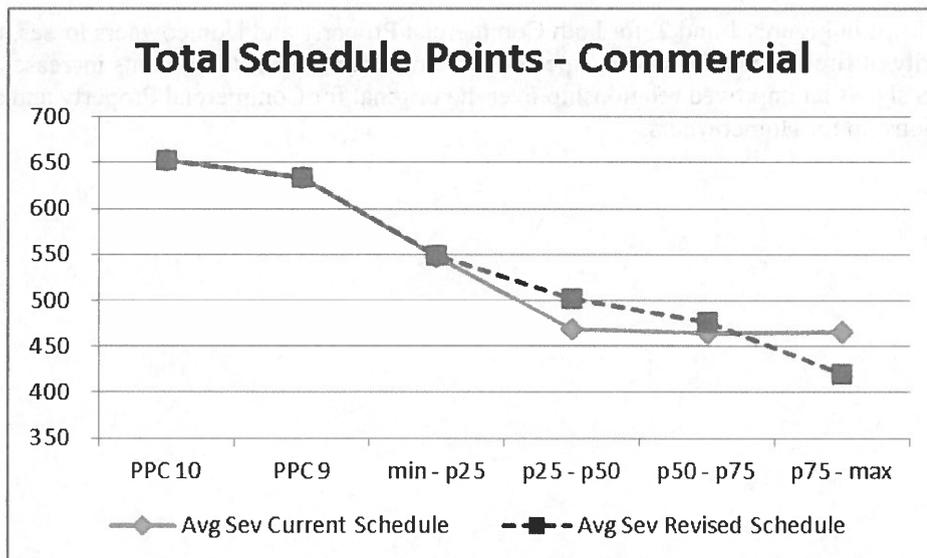


Figure 1: Average Severity by Total Schedule Points for Commercial Losses

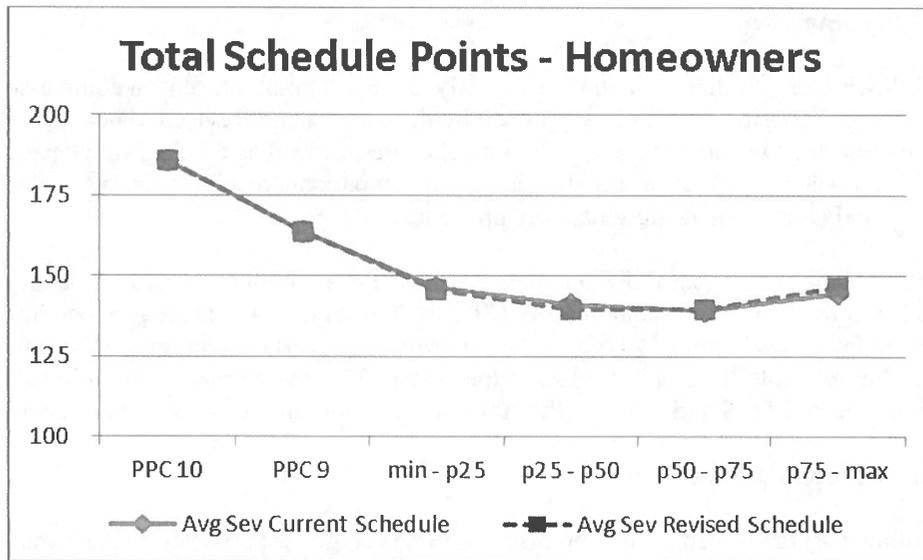


Figure 2: Average Severity by Total Schedule Points for Homeowners Losses

As shown in Figures 1 and 2, for both Commercial Property and Homeowners losses, the average severity of fire losses follows the expected pattern, decreasing as total points increase. The new FSRS shows an improved relationship over the original for Commercial Property and a similar relationship for Homeowners.

Fire Department Evaluation

The graphs below present the results of the analysis of the Fire Department portion of the Current and Revised FSRS. Average Fire Severity again generally shows a downward slope as fire points increase for both the current and revised Schedules.

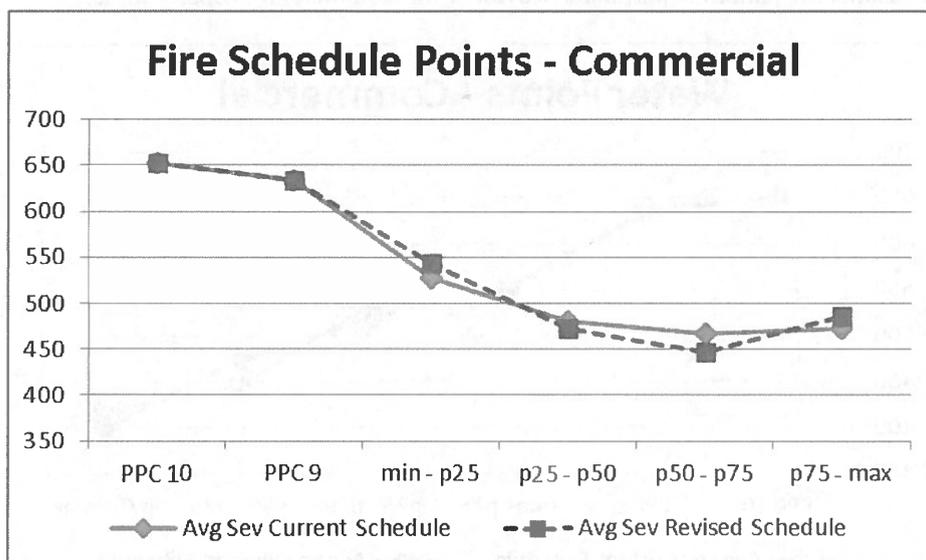


Figure 3: Average Severity by Fire Schedule Points for Commercial Property Losses

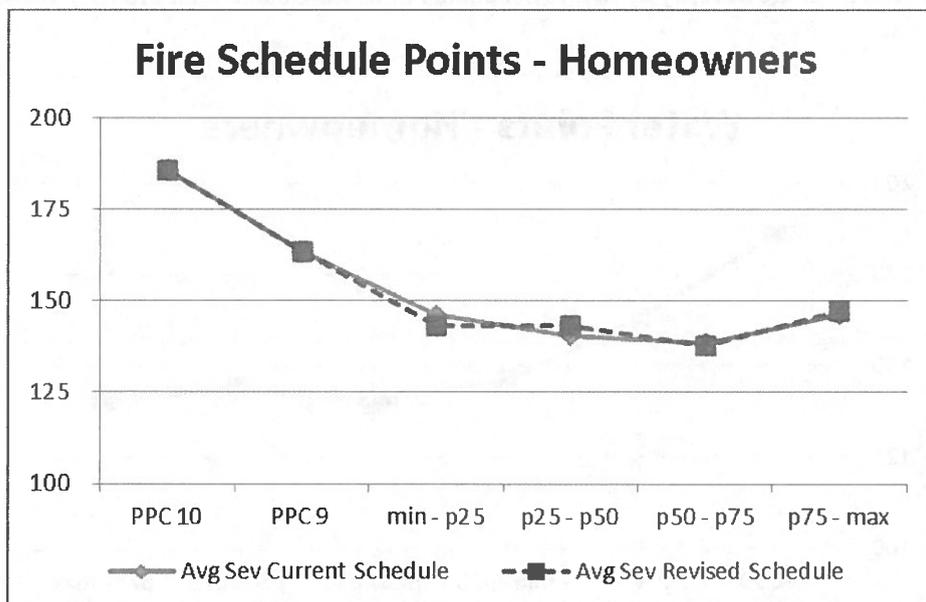


Figure 4: Average Severity by Fire Schedule Points for Homeowners Losses

Water Supply Evaluation

The graphs below present the results of the analysis of the Water Supply portion of the current and revised FSRS. From the figures, it is clear that Average Fire Severity shows a decreasing pattern as water points increase for both Commercial Property and Homeowner losses. Similar to the earlier results, the pattern is particularly evident for Commercial Property losses.

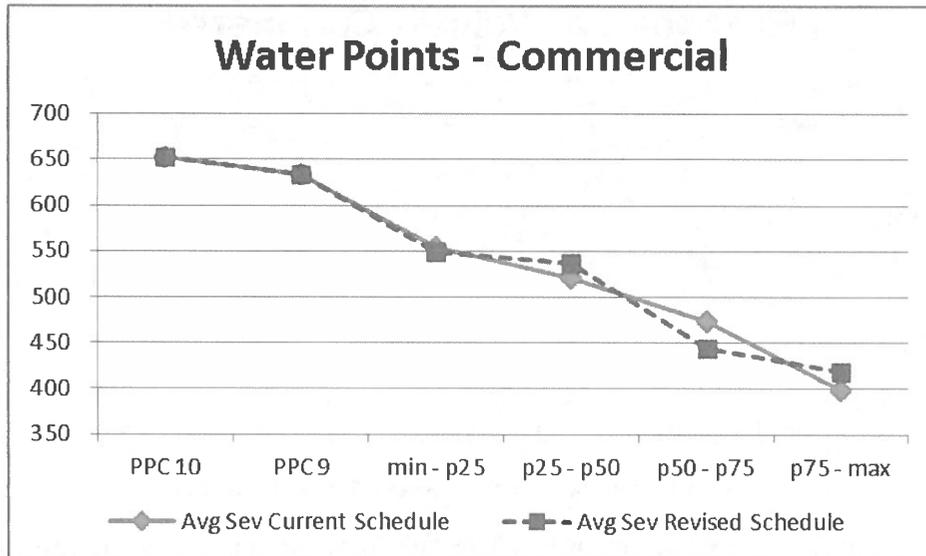


Figure 5: Average Severity by Water Schedule Points for Commercial Property Losses

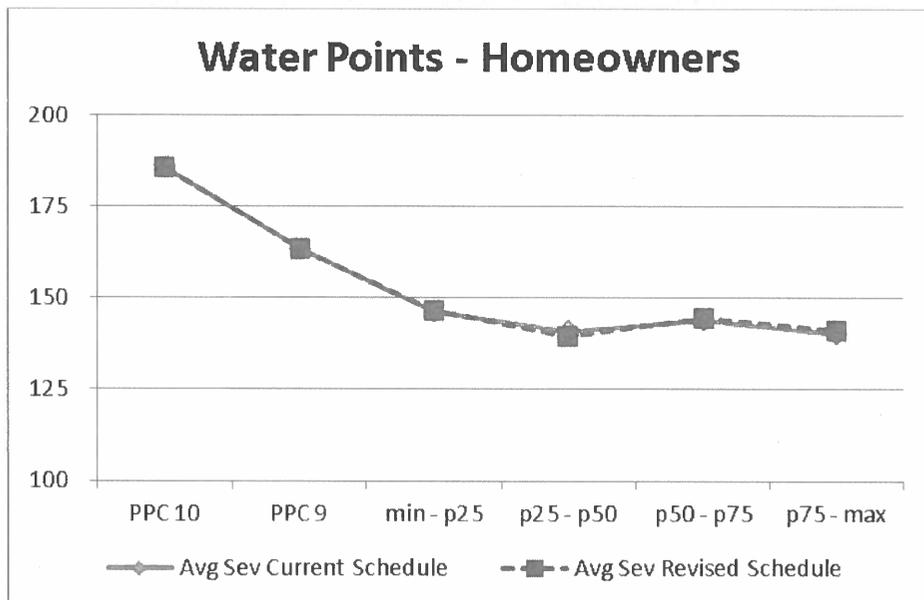


Figure 6: Average Severity by Water Schedule Points for Homeowners Losses

Alarm and Communication Evaluation

The graphs below present the results of the analysis of the Alarm and Communication portion of the current and revised FSRS. From the figures, Average Fire Severity shows a decreasing pattern as alarm points increase for both Commercial Property and Homeowners losses. Similar to the earlier results, the pattern is particularly evident for Commercial Property losses, where the revised FSRS shows a continuously decreasing pattern.

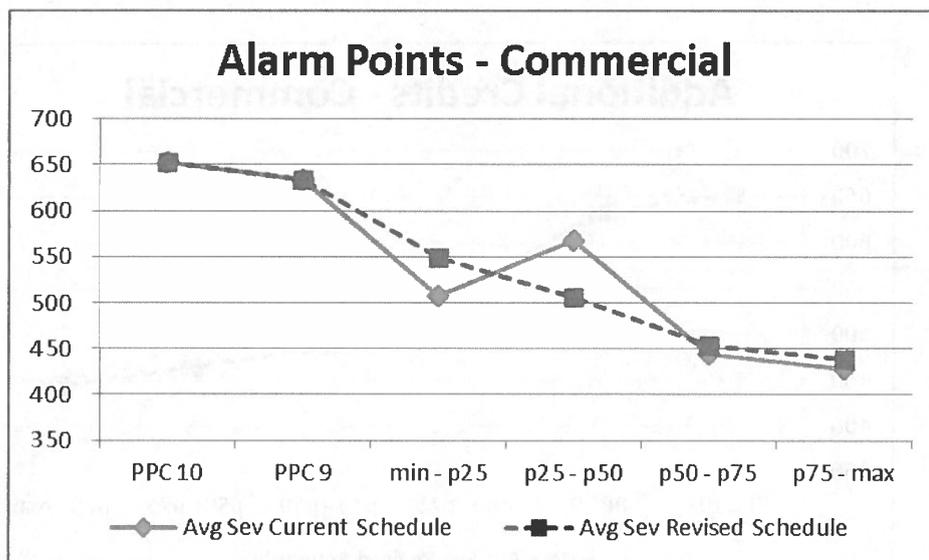


Figure 7: Average Severity by Alarm Schedule Points for Commercial Property Losses

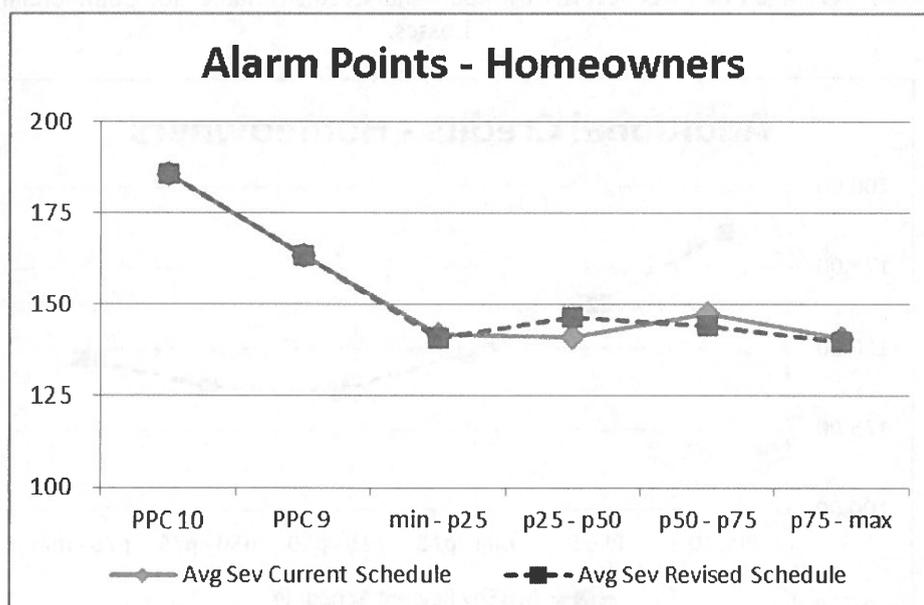


Figure 8: Average Severity by Alarm Schedule Points for Homeowners Losses

Additional Available Credit Points - Revised FSRS

Additional variables have been introduced in the revised FSRS. These items reflect various community fire mitigation efforts. A total of 5.5 additional points is available to a community. These additional points, if earned by a community, will serve to improve that community's PPC grade. The graphs illustrate that the Average Fire Severity shows a similar downward trend by total additional credit points earned, with a more significant trend for Commercial Property losses.

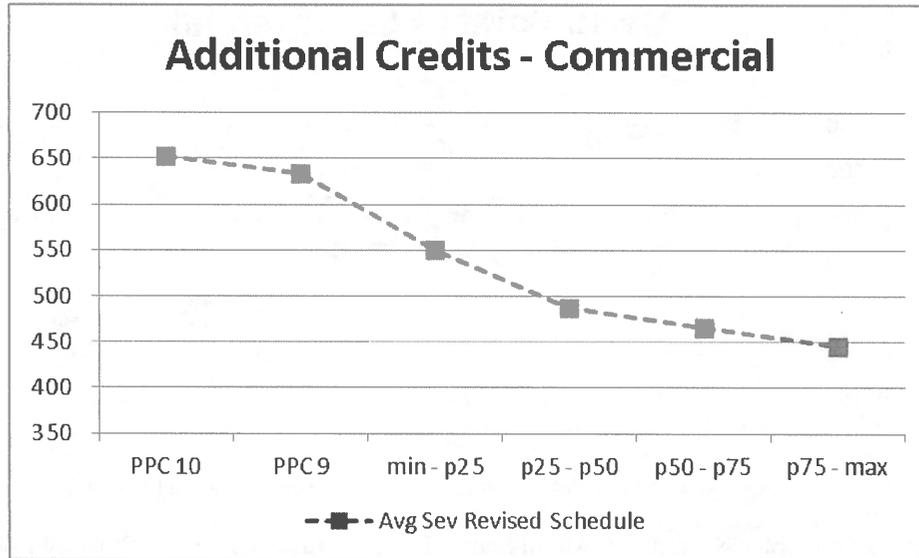


Figure 9: Average Fire Loss Severity by Additional Credit variables for Commercial Property Losses.

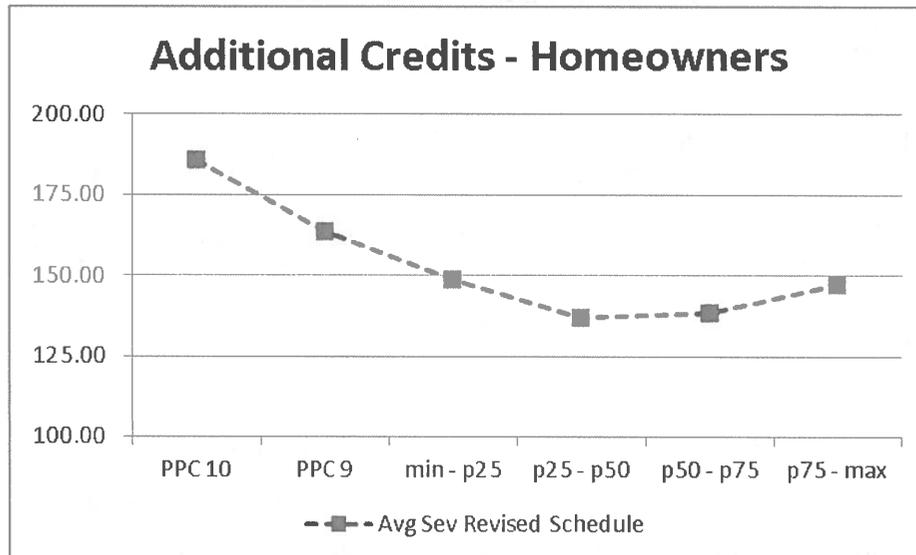


Figure 10: Average Fire Loss Severity by Additional Credit variables for Homeowners Losses.

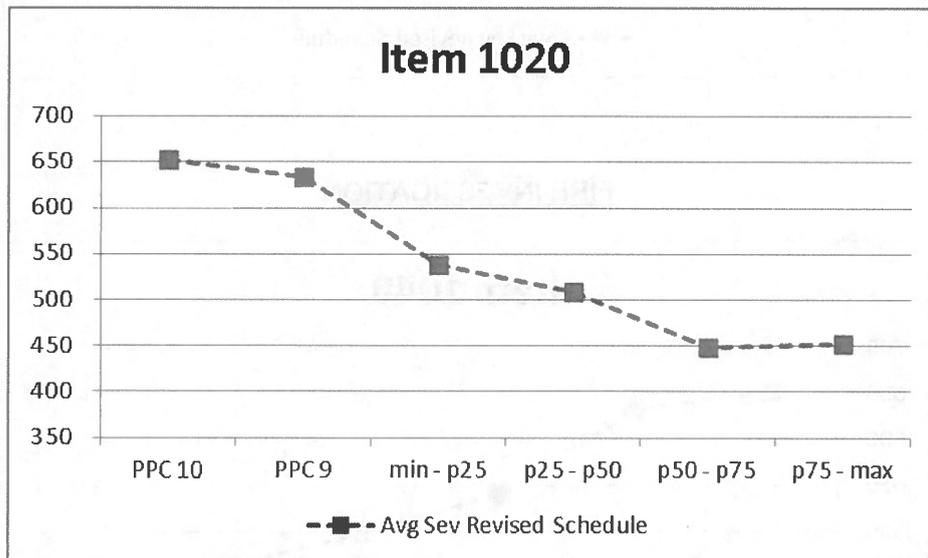
Additional Available Credit Points - Revised FSRS - Analysis By Individual Item

This section presents analyses of the individual Community Mitigation Points. There are three individual items in this area:

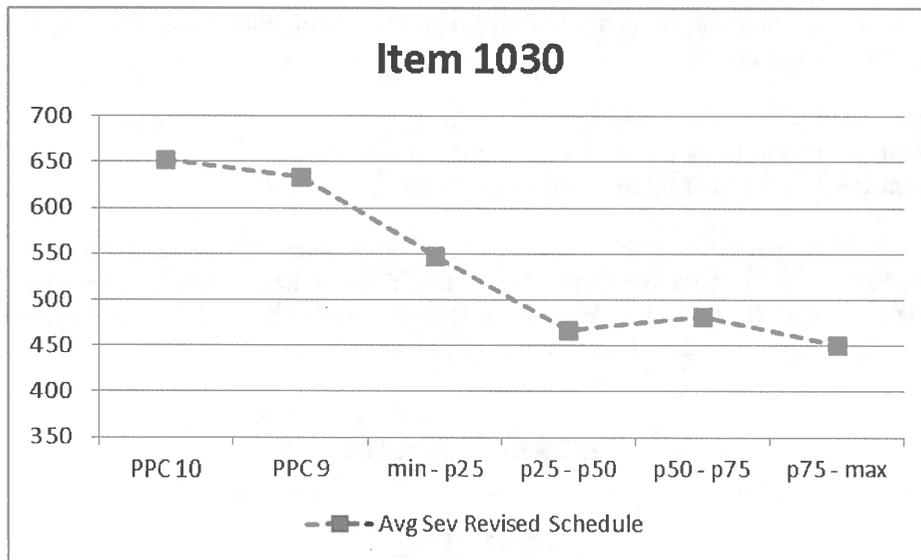
- Item 1020 – Fire Prevention, up to 2.2 points
- Item 1030 – Public Fire Education, up to 2.2 points
- Item 1040 – Fire Investigation, up to 1.1 points

For these individual items, the pattern is as expected. While Item 1030 is somewhat flat at its higher percentiles, this is due to the fact that more than 50% of the communities have point values between 0.67 and 0.95 for this item. With maximum possible points of 2 for this item, the observed relationship is due to a narrow spread of possible point values.

FIRE PREVENTION



PUBLIC FIRE EDUCATION



FIRE INVESTIGATION

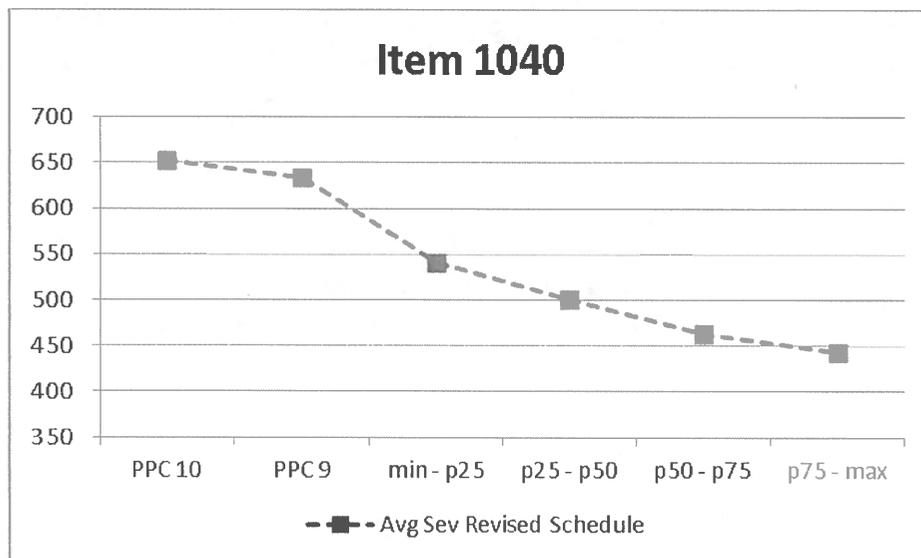


Figure 1.4.2: Fire severity by individual extra credit variables

Introduction of Additional Public Protection Classification

About This Filing

This filing introduces a new Public Protection Classification known as Class 8B which will provide recognition for a superior level of fire protection.

Revised Rule

We are revising the classifications rule in the Public Protection Manual:

Background

ISO collects information on municipal fire protection efforts in communities throughout the United States. In Hawaii, this responsibility is the responsibility of the Hawaii Insurance Bureau. .

In each of those communities, the relevant data is analyzed using the Fire Suppression Rating Schedule (FSRS). The FSRS measures and evaluates the major elements of a community's fire suppression system, which include Fire Department, Emergency Communications and Water Supply capabilities. The FSRS assigns a point value for these various elements which determine that community's Public Protection Classification (PPC) grade. PPC grades range from one to ten. Class 1 represents exemplary fire suppression capabilities while Class 10 represents areas that do not meet minimum FSRS criteria.

The overall purpose of ISO's Public Protection Classification Program is to identify differing levels of public fire protection which helps insurance companies measure and assess fire mitigation services throughout the country in a uniform and consistent manner. Additionally, the PPC program provides a mechanism to publicly recognize communities for superior fire suppression capabilities.

Introduction

This filing introduces a new Public Protection Classification to be known as Class 8B, which will allow for recognition for a superior level of fire protection in otherwise Class 9 areas.

A Public Protection Classification of 9 has traditionally represented a condition where the fire department service and fire alarm facilities meet only the minimum criteria of the FSRS with no water supply suitable for structural fire suppression.

It has been recognized that many fire departments with improved fire fighting capability through superior equipment, training and management techniques have improved their effectiveness to compensate for the lack of traditional water supplies. Such fire departments have distinguished themselves from the normally expected level of protection afforded in the majority of Class 9 communities. It is these superior fire departments operating in a challenging environment of limited water supplies that new Public Protection Class 8B is recognizing.

Explanation of Changes

The Classifications rule of the Hawaii Insurance Bureau Public Protection manual has been revised to reference the new Class 8B PPC designation.

Attachments

Hawaii Insurance Bureau Public Protection Manual Rule Revision

Copyright Explanation

The material distributed by Insurance Services Office, Inc. is copyrighted. All rights reserved. Possession of these pages does not confer the right to print, reprint, publish, copy, sell, file or use same in any manner without the written permission of the copyright owner.

Important Note

Insurance Services Office, Inc. (ISO) makes available advisory services to property/casualty insurers. ISO has no adherence requirements. ISO rules and explanatory materials are intended solely for the information and use of ISO's participating insurers and their representatives, and insurance regulators. Neither ISO's general explanations of rules intent nor opinions expressed by members of ISO's staff necessarily reflect every insurer's view or control any insurer's application of manual rules.

A. GENERAL INFORMATION

The Hawaii Insurance Bureau, Inc. evaluates available public fire protection facilities to develop a public protection classification used for property underwriting purposes. Communities are assigned a public protection classification number on a relative scale from 1 to 10, (10 representing less than the minimum recognized fire protection).

This existing Public Protection Schedule evaluates three major areas which include ~~receiving and handling fire alarms~~ Emergency Communications, fire department and water supply. Community risk reduction includes: fire prevention and code enforcement, public fire safety education and fire investigation.

B. CLASSIFICATIONS

1. Where the building is within a protection area published with a single classification number, apply the single protection classification.
2. Where classified areas are published with a split classification number (e.g., 6/9, 6/8B), the classification is determined as follows:
 - a. Where the building is **within 1,000 feet of a standard fire hydrant** credible water supply such as a standard fire hydrant and within 5 all weather road miles of a responding fire station, apply the first listed protection class (e.g., 6/9, or 6/8B, use Class 6).
 - b. Where the building is **over 1,000 feet from a standard fire hydrant** credible water supply, **but is within 5 all weather road miles of a responding fire station**, apply Class 9 or 8B.
 - c. Where the building is **more than 5 all weather road miles of a responding fire station**, apply Class 10.
 - d. Distance to fire station and nearest ~~standard fire hydrant~~ credible water supply may require field verification since community boundaries and ~~hydrant installations~~ water sources change over time.
3. Where classified areas are published as a **triple classification** and the last classification is a 10 (e.g., 6/9/10 or 6/8B/10), the classification is determined by the same method as outlined in 2. above. The 10 alerts you to the fact that a substantial portion of the listed community may fall beyond the 5 all weather road mile limit, therefore unprotected.
4. Some classified areas may be published as a **triple classification**, such as 6/7/9 or 6/7/8B. This indicates that a portion of the community is within 5 all weather road miles of one fire station, and that the rest is within 5 all weather road miles of another fire station with a differing public protection classification. The 9 or 8B still indicates no ~~hydrant~~ credible water supply within 1,000 feet and will not change regardless of which station is within 5 all weather road miles.

5. If a building is located within 5 all weather road miles of 2 fire stations with differing public protection classifications, it may take the better public protection classification unless there are no hydrants creditable water sources are within 1,000 feet (Class 9 or 8B).

5.6. If the line of insurance manual does not contain rating provisions for PPC 8B use PPC 9 for rating purposes.

NOTE: Standard fire hydrant - must be supplied by water mains not less than 4 inches in diameter and be capable of delivering 250 GPM or more for a period of 2 hours. Hydrants must be equipped with two 2 ½ inch hose outlets, or a pumper outlet of at least 4 inches.

C. ABBREVIATIONS

Prot Class - Protection Class

Cert Date - Certification Date

EXPLANATORY MEMORANDUM
FIRE SUPPRESSION RATING SCHEDULE

BACKGROUND

In the early 1900's, major U.S. cities, which included Honolulu, suffered disastrous fires that destroyed billions of dollars worth of property. After these fires, insurance companies realized they needed a tool that would provide them with advanced information on the fire-loss characteristics of individual communities. The Fire Suppression Rating Schedule (FSRS) was developed to examine and grade a community's ability to suppress fires. The results are then transformed into Public Protection Classifications. The Hawaii Insurance Bureau, Inc. (HIB) has been using the 1980 version of the FSRS for the past thirty-years.

The FSRS was developed in conjunction with the National Fire Protection Association and the American Water Works Association. As mentioned, the FSRS results are translated into PPC grades which range from one through ten. Grade one being the best and ten represents no fire protection for the community.

SUMMARY OF THE FIRE SUPPRESSION RATING SCHEDULE

The FSRS focuses on three areas of a community's fire suppression capability, which are: the fire department, call center, and water supply.

- For the call center the following are examined: fire alarm and communications systems – including telephone systems, telephone lines, staffing, and dispatching systems.
- For the fire department – examination includes equipment, staffing, training and geographic distribution of fire companies
- For the water supply system – examination includes condition and maintenance of hydrants, and a careful evaluation of the amount of water available compared with the amount needed to suppress fires

TABLE OF CONTENTS

Fire Suppression Rating Schedule.....pages 1-54

TABLE OF CONTENTS

100.	INTRODUCTION	1
SECTION I: PUBLIC FIRE SUPPRESSION		3
200.	GENERAL	5
300.	NEEDED FIRE FLOW	6
400.	RECEIVING AND HANDLING FIRE ALARMS	11
500.	FIRE DEPARTMENT	16
600.	WATER SUPPLY	32
700.	TOTAL CREDIT AND CLASSIFICATION	38
800.	CLASS 9 PROTECTION	39
SECTION II: INDIVIDUAL PROPERTY FIRE SUPPRESSION		41
900.	GENERAL	43
1000.	FIRE DEPARTMENT COMPANIES	43
1100.	WATER SUPPLY SYSTEM	45
1200.	CREDIT AND CLASSIFICATION	46
NOTES		47

FIRE SUPPRESSION RATING SCHEDULE

INTRODUCTION

100. PURPOSE:

The purpose of this Schedule is to review the available public fire suppression facilities, and to develop a Public Protection Classification for fire insurance rating purposes.

101. SCOPE:

The Schedule measures the major elements of a city's fire suppression system. These measurements are then developed into a Public Protection Classification number on a relative scale from 1 to 10, with 10 representing less than the minimum recognized protection.

The Schedule is a fire insurance rating tool, and is not intended to analyze all aspects of a comprehensive public fire protection program. It should not be used for purposes other than insurance rating.

102. PUBLIC PROTECTION CLASSIFICATION:

- The Public Protection Classifications developed by this Schedule are only one of several elements used to develop fire insurance rates for individual properties. Other features specifically relating to individual properties such as construction, occupancy, processing hazards, exposures and private fire protection have similar importance in the development of fire insurance rates.

103. CITY:

The word "city" is used in this Schedule in a broad sense to include cities, towns, villages, districts, counties, or other civil jurisdictions.

104. FORMAT:

This Schedule consists of 2 major sections:

I. Public Fire Suppression:

This section develops a Public Protection Classification for all class-rated properties and for specifically rated properties with a Needed Fire Flow of 3,500 gpm or less (Items 300 to 701).

II. Individual Property Fire Suppression:

This section develops Public Protection Classifications for specifically rated properties that have a Needed Fire Flow greater than 3,500 gpm (Items 900 to 1211).

105. CALCULATIONS:

Whenever in this Schedule it is necessary to prorate credits, or to make any calculation using less than a whole percent or point, the following rules shall apply unless otherwise directed.

- A. All calculations that result in a 3 or more decimal place figure shall be rounded to a 2 decimal place figure, promoting 0.005 or more, and dropping 0.004 or less (e.g., 12.544 = 12.54; 12.555 = 12.56).
- B. All calculations using points shall be rounded to the nearest whole number, promoting 0.5 points or more, and dropping 0.4 points or less (e.g., 12.4 points = 12 points; 12.5 points = 13 points).

106. MINIMUM FACILITIES FOR APPLYING THIS SCHEDULE:

In order to develop a Public Protection Classification other than Class 10 the following minimum facilities must be available:

A. Organization:

The fire department shall be organized on a permanent basis under applicable state or local laws. The organization shall include one person responsible for operation of the department, usually with the title of chief.

The fire department must serve an area with definite boundaries. If a city is not served by a fire department operated solely by or for the governing body of that city, the fire department providing such service shall do so under a legal contract or resolution. When a fire department's service area involves one or more cities, a contract should be executed with each city served.

B. Membership:

The department shall have sufficient membership to assure the response of at least 4 members to fires in structures. The chief may be one of the 4 responding members.

C. Training:

Training for active members shall be conducted at least 2 hours every 2 months.

D. Alarm Notification:

Alarm facilities and arrangement shall be such that there is no delay in the receipt of alarms and the dispatch of fire fighters and apparatus.

E. Apparatus:

There shall be at least one piece of apparatus meeting the general criteria of National Fire Protection Association (NFPA) Standard 1901, Automotive Fire Apparatus.

F. Housing:

Apparatus shall be housed to provide protection from the weather.

SECTION I
PUBLIC
FIRE
SUPPRESSION

GENERAL

200. GENERAL:

This Section develops a Public Protection Classification that applies to all class-rated properties and to specifically rated properties with a Needed Fire Flow of 3,500 gpm or less as determined in Item 300.

201. APPLICATION:

The method of applying this Section is dependent upon the minimum facilities available for the fire department and for the water supply as outlined below:

- A. If the city has both of the following, Items 300 through 701 shall be applied:
 - 1. A piece of apparatus that has a pump with a rated capacity of 250 gpm or more at 150 psi.
 - 2. A water system capable of delivering 250 gpm or more for a period of 2 hours, plus consumption at the maximum daily rate at a fire location.
- B. If the city does **not** have the facilities outlined in A, but does have at least one piece of apparatus that has a pump with a capacity of 50 gpm or more at 150 psi and at least a 300-gallon water tank, Items 800 through 812 shall be applied.
- C. If the city does **not** have the facilities outlined in either A or B, the Schedule items do not apply and the city shall be assigned Public Protection Class 10.
- D. If the city has a combination of A, B, or C, multiple Public Protection Classifications apply.

NEEDED FIRE FLOW

300. GENERAL:

This item develops Needed Fire Flows for selected locations throughout the city, which are used in the review of subsequent items of this Schedule. The calculation of a Needed Fire Flow (NFF) for a subject building in gallons per minute (gpm) considers the Construction (C_i), Occupancy (O_i), Exposure (X_i) and Communication (P_i) of each selected building, or fire division, as outlined below.

310. CONSTRUCTION FACTOR (C_i):

That portion of the Needed Fire Flow attributed to the construction and area of the selected building is determined by the following formula:

$$C_i = 18F (A_i)^{0.5}$$

F = Coefficient related to the class of construction:

- $F = 1.5$ for Construction Class 1* (Frame)
- $= 1.0$ for Construction Class 2* (Joisted Masonry)
- $= 0.8$ for Construction Class 3* (Non-Combustible) and Construction Class 4* (Masonry Non-Combustible)
- $= 0.6$ for Construction Class 5* (Modified Fire Resistive) and Construction Class 6* (Fire Resistive)

A_i = Effective* area

In buildings with mixed construction a value, C_{im} , shall be calculated for each class of construction using the effective area of the building. These C_{im} values are multiplied by their individual percentage of the total area. The C_i applicable to the entire building is the sum of these values. However, the value of the C_i shall not be less than the value for any part of the building based upon its own construction and area.

The maximum value of C_i is limited by the following:

- 8,000 gpm for Construction Classes 1 and 2
- 6,000 gpm for Construction Classes 3, 4, 5 and 6
- 6,000 gpm for a 1-story building of any class of construction

The minimum value of C_i is 500 gpm. The calculated value of C_i shall be rounded to the nearest 250 gpm.

320. OCCUPANCY FACTOR (O_i):

The factors below reflect the influence of the occupancy in the selected building on the Needed Fire Flow:

OCCUPANCY COMBUSTIBILITY CLASS*	OCCUPANCY FACTOR (O_i)
C-1* (Non-Combustible)	0.75
C-2* (Limited Combustible)	0.85
C-3* (Combustible)	1.00
C-4* (Free Burning)	1.15
C-5* (Rapid Burning)	1.25

330. EXPOSURE (X_i) AND COMMUNICATION (P_i) FACTORS:

The factors developed in this item reflect the influence of exposed and communicating buildings on the Needed Fire Flow. A value for ($X_i + P_i$) shall be developed for each side of the subject building:

$$(X + P)_i = 1.0 + \sum_{i=1}^n (X_i + P_i), \text{ maximum } 1.75, \text{ where } n = \text{number of sides of subject building.}$$

A. Factor for Exposure (X_i):

The factor for X_i depends upon the construction and length-height value* (length of wall in feet, times height in stories) of the exposed building and the distance between facing walls of the subject building and the exposed building, and shall be selected from Table 330.A.

*When an asterisk is shown next to a term in this item, the term is defined in greater detail in the Specific Commercial Property Evaluation Schedule.

TABLE 330.A FACTOR FOR EXPOSURE (X_i)

Construction of Facing Wall of Subject Building	Distance Feet to the Exposed Building	Length-Height of Facing Wall of Exposed Building	Construction of Facing Wall of Exposed Building Classes			
			1, 3	2, 4, 5, & 6		
				Unprotected Openings	Semi-Protected Openings (wired glass or outside open sprinklers)	Blank Wall
Frame, Metal or Masonry with Openings	0-10	1-100	0.22	0.21	0.16	0
		101-200	0.23	0.22	0.17	0
		201-300	0.24	0.23	0.18	0
		301-400	0.25	0.24	0.19	0
		Over 400	0.25	0.25	0.20	0
	11-30	1-100	0.17	0.15	0.11	0
		101-200	0.18	0.16	0.12	0
		201-300	0.19	0.18	0.14	0
		301-400	0.20	0.19	0.15	0
		Over 400	0.20	0.19	0.15	0
	31-60	1-100	0.12	0.10	0.07	0
		101-200	0.13	0.11	0.08	0
		201-300	0.14	0.13	0.10	0
		301-400	0.15	0.14	0.11	0
		Over 400	0.15	0.15	0.12	0
	61-100	1-100	0.08	0.06	0.04	0
		101-200	0.08	0.07	0.05	0
		201-300	0.09	0.08	0.06	0
		301-400	0.10	0.09	0.07	0
		Over 400	0.10	0.10	0.08	0
Blank Masonry Wall	Facing Wall of the Exposed Building Is Higher Than Subject Building: Use the above table EXCEPT use only the Length-Height of Facing Wall of the Exposed Building ABOVE the Height of the Facing Wall of the Subject Building. Buildings five stories or over in Height, consider as five stories.					
	When the Height of the Facing Wall of the Exposed Building is the Same or Lower than the Height of the Facing Wall of the Subject Building, $X_i = 0$.					

330. EXPOSURE (X_i) AND COMMUNICATION (P_i) FACTORS: (Continued)

B. Factor for Communications (P_i):

The factor for P_i depends upon the protection for communicating party wall* openings and the length and construction of communications between fire divisions* and shall be selected from Table 330.B. When more than one communication type exists in any one side wall, apply only the largest factor P_i for that side. When there is no communication on a side, $P_i = 0$.

*When an asterisk is shown next to a term in this item, the term is defined in greater detail in the Specific Commercial Property Evaluation Schedule.

TABLE 330.B FACTOR FOR COMMUNICATIONS (P_i)

Description of Protection of Passageway Openings	Fire Resistive, Non-Combustible or Slow-Burning Communications				Communications with Combustible Construction					
	Open		Enclosed		Open			Enclosed		
	Any Length	10 Ft. or Less	11 Ft. to 20 Ft.	21 Ft. to 50 Ft. +	10 Ft. or Less	11 Ft. to 20 Ft.	21 Ft. to 50 Ft. +	10 Ft. or Less	11 Ft. to 20 Ft.	21 Ft. to 50 Ft. +
Unprotected	0	+ +	0.30	0.20	0.30	0.20	0.10	+ +	+ +	0.30
Single Class A Fire Door at One End of Passageway	0	0.20	0.10	0	0.20	0.15	0	0.30	0.20	0.10
Single Class B Fire Door at One End of Passageway	0	0.30	0.20	0.10	0.25	0.20	0.10	0.35	0.25	0.15
Single Class A Fire Door at Each End or Double Class A Fire Doors at One End of Passageway	0	0	0	0	0	0	0	0	0	0
Single Class B Fire Door at Each End or Double Class B Fire Doors at One End of Passageway	0	0.10	0.05	0	0	0	0	0.15	0.10	0

+ For over 50 feet, $P_i = 0$.

+ + For unprotected passageways of this length, consider the 2 buildings as a single Fire Division.

Note: When a party wall has communicating openings protected by a single automatic or self-closing Class B fire door, it qualifies as a division wall* for reduction of area.

Note: Where communications are protected by a recognized water curtain, the value of P_i is 0.

*When an asterisk is shown next to a term in this item, the term is defined in greater detail in the Special Commercial Property Evaluation Schedule.

340. CALCULATION OF NEEDED FIRE FLOW (NFF_i):

$$NFF_i = (C_i)(O_i)[1.0 + (X + P)_i]$$

When a wood shingle roof covering on the building being considered, or on exposed buildings, can contribute to spreading fires, add 500 gpm to the Needed Fire Flow.

The Needed Fire Flow shall not exceed 12,000 gpm nor be less than 500 gpm.

The Needed Fire Flow shall be rounded off to the nearest 250 gpm if less than 2,500 gpm and to the nearest 500 gpm if greater than 2,500 gpm.

Note 1: For 1- and 2-family dwellings not exceeding 2 stories in height, the following Needed Fire Flows shall be used:

DISTANCE BETWEEN BUILDINGS	NEEDED FIRE FLOW
Over 100'	500 gpm
31-100'	750
11-30'	1,000
10' or less	1,500

Note 2: Other habitational buildings, up to 3,500 gpm maximum.

RECEIVING AND HANDLING FIRE ALARMS

400. GENERAL:

This item reviews the telephone facilities provided for the general public to report fires, the operators on duty at the communication center, and the facilities used to dispatch fire department companies to the fire.

410. TELEPHONE SERVICE (TS):

Telephone service for fire alarms should be in accordance with the general criteria of NFPA Standard 1221 – Installation Emergency Services Communications Systems Maintenance and Use Of. The needed number of telephone lines reserved for receiving fire calls and business calls, at any one communication center, is indicated below:

POPULATION SERVED	NUMBER OF RESERVED LINES	
	Fire	Business
Up to 40,000	1	1
40,001 - 125,000	2	2
125,001 - 300,000	3	3
Over 300,000	4	3

A. Other Emergency Calls:

When emergency calls for other than fire are received over the fire number, double the number of needed reserved fire lines indicated above.

B. Automatic Equipment:

Automatic telephone dialing equipment used to report alarms from private fire detection systems should have an emergency line separate from the normal fire and business numbers.

C. Business Number:

When only one telephone number is listed in the telephone directory, no credit shall be given for a reserved fire line.

D. Progression:

When the number of reserved fire lines equals or exceeds the number of needed fire and business lines, and there is progression in the fire lines, credit shall be given for progression from the fire lines to the business lines even if there is no progression.

411. REVIEW OF TELEPHONE LINES (TL):

- A. Number of needed fire lines provided, up to **25 points**
- B. Number of needed fire, business and private alarm lines provided, up to **25 points**
- C. Progression of emergency calls to business lines **10 points**
- D. If detailed information of a fire is received and transmitted through more than one communication center, DEDUCT **20 points**

412. REVIEW OF TELEPHONE DIRECTORY (TD):

- A. Fire emergency telephone number printed on the inside front cover or front page of the white pages directory **10 points**

Note: Blank lines for the convenience of customers, even with headings of FIRE or EMERGENCY, are not eligible for credit.

- B. Both the number to report a fire and the fire department business number are listed under "Fire Department" in the white pages **5 points**
- C. Both the number to report a fire and the fire department business number are listed under the name of the city in the white pages **5 points**
- D. If the numbers for individual fire stations are listed, DEDUCT **10 points**

413. REVIEW OF RECORDING DEVICE (RD):

With arrangement for immediate playback

20 points

414. CREDIT FOR TELEPHONE SERVICE (CTS):

$$CTS = \frac{TS}{100} \times 2$$

$$TS = TL + TD + RD$$

420. NUMBER OF NEEDED OPERATORS (NO):

The number of operators on duty to handle fire calls should be in accordance with NFPA Standard 1221. No credit shall be given for operators when the telephone line for reporting fires extends to a number of locations, such as residences, places of business or fire stations, and no definite schedule of attendance at the telephone is provided.

421. REVIEW OF OPERATORS (PO):

A. Number of Operators on Duty (OD):

$$\frac{(OD)(80)}{NO} \text{ up to}$$

80 points

B. Number of Operators Awake at All Times (OA):

$$\frac{(OA)(20)}{NO} \text{ up to}$$

20 points

$$PO = A + B$$

422. CREDIT FOR OPERATORS (CTO):

$$CTO = \frac{PO}{100} \times 3$$

430. DISPATCH CIRCUITS (DC):

Dispatch circuit facilities used to transmit alarms to fire department members should be provided in accordance with the general criteria of NFPA Standard 1221. If all responding fire fighters are in the same building as the communication center, and are alerted, no dispatch circuit is needed. No credit will be given for facilities that are installed but not used.

	NUMBER OF NEEDED CIRCUITS		
	1	2	
		Primary	Secondary
A. Dispatch Circuit(s) Provided: Apply only one of the following for each needed dispatch circuit. Maximum credit for this subitem is 40 points.			
1. Circuit to fire station where personnel are on duty:			
a. The circuit consists of radio, voice-amplification, facsimile, or teletype facilities.	40	20	20
b. The circuit indicates only the box number or street intersection.	30	15	15
When the circuit indicated above is provided, and there is a telephone circuit or other means of transmitting detailed information to the fire station, add	10	5	5
c. The circuit consists only of a telephone circuit.	10	5	5
2. Radio Receivers Carried By Members: The circuit consists of a radio transmitter at the communication center and receivers carried by members.			
a. Voice or alphanumeric receivers.	40	20	20
b. Coded tone receivers.	30	15	15
c. Non-coded tone receivers.	20	10	10
When the circuit indicated in "b" or "c" above is provided, and there is a telephone circuit or other means of transmitting detailed information to the fire station, add	5	3	3
3. Circuit To Outside Coded Sounding Device: The circuit is to an outside coded sounding device to notify members.	30	15	15
When the circuit indicated above is provided, and there is a telephone circuit or other means of transmitting detailed information to the fire station, add	5	3	3
4. Circuit To Outside Non-coded Sounding Device: The circuit is to an outside non-coded sounding device to notify members.	20	10	10
When the circuit indicated above is provided, and there is a telephone circuit or other means of transmitting detailed information to the fire station, add	5	3	3

	NUMBER OF NEEDED CIRCUITS		
	1	2	
		Primary	Secondary
5. Radio To Members' Homes and Businesses: The circuit consists of a radio transmitter at the communication center and voice receivers in the homes and businesses of members.	20	10	10
6. Group Alerting Telephone Circuit: The circuit consists of a group alerting telephone circuit to telephones in the homes and business of members.	20	10	10
7. No Circuit Provided:	0	0	0
B. Monitoring for Integrity of Circuit:	30	30	—
C. Dispatch Recording Facilities at Communication Center:	10	5	5
D. Emergency Power Supply: Apply only one of the following for each needed dispatch circuit. When a dispatch circuit is dependent upon power at both transmitting and receiving facilities, credit the emergency power arrangement with the least points. Maximum credit for this subitem is 20 points.			
1. Batteries and manually-started generator:	20	10	10
2. Automatically-started generator:	20	10	10
3. Manually-started generator:	15	8	8
4. Batteries only:	10	5	5
When strength and duration of batteries meet Standard, add	10	5	5
5. No emergency power provided:	0	0	0
E. When no circuit is needed:	100	—	—

Note: If some companies and members are notified by one method and others by another method, prorate the points by the number of on-duty, or equivalent call or volunteer, members alerted by each method.

432. CREDIT FOR DISPATCH CIRCUITS (CDC):

$$CDC = \frac{PC}{100} \times 5$$

440. CREDIT FOR RECEIVING AND HANDLING FIRE ALARMS (CFA):

$$CFA = CTS + CTO + CDC$$

FIRE DEPARTMENT

500. GENERAL:

This item reviews the engine and ladder-service companies, equipment carried, response to fires, training and available fire fighters.

501. BASIC FIRE FLOW (BFF):

From the Needed Fire Flows, determined in Item 340, the 5th highest is considered to be the Basic Fire Flow. The Needed Fire Flows for buildings in the city rated and coded sprinklered are not considered in determining the Basic Fire Flow. The maximum Basic Fire Flow is 3,500 gpm.

510. NUMBER OF NEEDED ENGINE COMPANIES (NE):

A. Number of Needed Engine Companies by Basic Fire Flow:

BASIC FIRE FLOW, GPM	NUMBER OF NEEDED ENGINE COMPANIES
500-1,000	1
1,250-2,500	2
3,000-3,500	3

B. Number of Needed Engine Companies for Distribution:

An additional engine company is needed for each area where a company needed in 510.A will not satisfy the first-due response distance, as defined in Item 560, to 50 percent or more of a standard response district. A standard response district is a built-upon area that is within satisfactory response travel distance.

An additional company is not needed for this item when it will not satisfy the response distance to at least 50 percent of a standard response district.

C. Number of Needed Engine Companies for Areas Outside the City:

When more than 10 percent of the total number of fire alarms are outside the city, and less than 50 percent of the companies needed for the city remain within the city, sufficient additional engine companies are needed to bring the number remaining within the city up to the 50 percent level. However, this provision is not applicable when an automatic-aid plan is credited under Item 512.

511. NUMBER OF EXISTING ENGINE COMPANIES (EE):

A. Engine Companies:

Pumpers that are staffed on first alarms will be credited as existing engine companies. Only apparatus with permanently mounted pumps rated at 250 gpm or more at 150 psi shall be credited in this item.

B. Engine-Ladder or Engine-Service Companies:

Apparatus that carries both pumper and ladder-service equipment that is staffed on first alarms shall be credited as an existing engine company if needed according to Item 510.

C. Automatic-Aid Engine Companies:

Engine companies from outside the city and within 5 miles of the city limits will be credited when they respond according to a definite plan and offset the lack of needed engine companies.

512. EQUIPMENT ON EXISTING ENGINE COMPANIES (E_i):

For each company meeting the criteria of Item 511, the following items shall be reviewed:

A. Pump Capacity (P_{C_i}):

The actual pump capacity for each existing pumper shall be credited at rated pump pressure.

$$P_{C_i} = \frac{\text{Pump capacity, up to 500 gpm}}{500 \text{ gpm}}$$

B. Hose Carried (H_{C_i}):

$$H_{C_i} = \frac{2\frac{1}{2}\text{-inch, up to 400 feet} + \text{additional } 2\frac{1}{2}\text{-inch or larger up to 800 feet}}{1,200 \text{ feet}}$$

C. Equipment (E_i)

The points credit for the equipment on each existing in-service pumper shall be determined from Tables 512.A, 512.B, and 512.C.

E_i = Sum of applicable points from Tables 512.A, 512.B, and 512.C.

D. Automatic-Aid Plan (AA_i):

The credit for responding automatic-aid companies is dependent upon the value of the automatic-aid arrangements (AA_i), which is determined by application of the following:

	MAXIMUM VALUE
1. Communication Facilities. The alarm dispatch circuit between the department communication centers or between a central communication center and the aiding fire station should be the equivalent of the needed facilities in the city being rated. Review the facilities using Item 431. Multiply the number of points developed by application of Item 431 by 0.002.	0.20
2. Receipt of Alarms. The aiding departments receive all alarms from the city being rated, and dispatch their companies in the plan by running cards or equivalent.	0.10
3. Inter-department Training.	0.35
a. Quarterly half-day, multiple-company drills with automatic-aid companies.	0.35
b. Semi-annual half-day, multiple-company drills with automatic-aid companies.	0.20
c. Annual half-day, multiple-company drills with automatic-aid companies.	0.10
4. Fire Ground Communications.	0.10
a. Common mobile and portable radio frequency capability.	0.10
b. Common mobile or portable radio frequency capability.	0.05
5. If joint communication center receives and dispatches all alarms, add	0.15
AA _i = Total, maximum	<u>0.90</u>

E. Calculation for Value of Existing Engine Companies (EC_i):

The value of EC_i for each existing engine company shall be determined by the following formula:

$$EC_i = (PC_i)(HC_i)(E_i)$$

Note 1: The value of EC_i shall be reduced by 2 percent for each 10 percent that the apparatus exceeds the manufacturer's gross vehicle weight rating.

Note 2: When automatic aid is credited to offset the lack of a needed engine company, multiply the value of EC_i by the AA_i developed for each credited automatic-aid engine company.

TABLE 512.A PUMPER EQUIPMENT AND HOSE

Equipment and Hose	Needed	Points Credit/Unit	Total Points
Booster Tank	300 gal.	1/10 gal.	30
Hose:			
Booster(*)	200'	3/50	12
1½-inch: carried	400'	3/50	24
spare (may also be carried)	200'	2/50	8
2½-inch: spare (may also be carried)	200'	3/50	12
Heavy Stream Appliance (1,000-gpm)†	1	100	100
Distributing Nozzle	1	5	5
Foam Nozzle (1½-inch min.)	1	4	4
Foam:			
carried	10 gal.	3/5 gal.	6
spare (may also be carried)	15 gal.	2/5 gal.	6
Nozzles:			
2½-inch playpipe with shutoff	2	20	40
2½-inch straight stream & spray with shutoff	2	30	60
1½-inch straight stream & spray with shutoff	2	10	20
Breathing Equipment (self-contained, 30-minute minimum)	4	16	64
Extra cylinders (carried)	4	4	16
Salvage Covers (12 ft. x 18 ft.)	2	2	4
Electric handlight (4V. wet, 6V. dry)	2	2	4
Hose Clamp	1	4	4
Hydrant Hose Gate (2½-inch)	1	4	4
Burst Hose Jacket (2½-inch)	1	4	4
Gated wye (2½ x 1½ x 1½)	1	4	4
Radio:			
Mounted	1	32	32
Portable	1	16	16
Ladders:			
12- or 14-ft. roof	1	10	10
24-ft. extension	1	15	15
Annual tests:			
Pumper (See Table 512.B)	1	100	100
Hose (See Table 512.C)	1	50	50
		Total	654

*Extra pre-connected 1½-inch hose may be substituted for booster hose.

†A heavy stream device is not needed for a Basic Fire Flow of less than 1,500 gpm.

TABLE 512.B PUMPER SERVICE TESTS

Average Interval Between 3 Most Recent Tests	Maximum Points Credit
1 year	100
2 years	75
3 years	50
4 years	25
5 years or more	0

A Pumper Service Test is similar to the Certification Test described in NFPA Standard 1901 except that the duration is reduced to 20 minutes at 150 psi, 10 minutes at 200 psi and 10 minutes at 250 psi. The overload test is not necessary. Service tests are described in the NFPA Standard 1911 – Standard for Service Tests of Fire Pump Systems on Fire Apparatus.

TABLE 512.C HOSE SERVICE TESTS

Average Interval Between 3 Most Recent Tests	Maximum Points Credit Test Pressure		
	250 psi	200 psi	150 psi
1 year	50	37	25
2 years	37	27	18
3 years	25	18	12
4 years	12	9	6
5 years or more	0	0	0

Tests for fire hose are described in NFPA Standard 1962 – Care, Use, and Service Testing of Fire Hose Including Couplings and Nozzles.

When the hose test frequency, pressure, or both vary for 2½-inch and larger hose and for 1½-inch hose, proportion the credit using 65 percent for the 2½-inch and larger hose, and 35 percent for the 1½-inch hose.

Note: If there are no records of tests claimed to have been conducted, reduce the applicable points credit by 20 percent for Tables 512.B and 512.C.

513. CREDIT FOR ENGINE COMPANIES (CEC):

$$CEC = \frac{[EC]}{654(NE)} [I + 0.5(I')] 10.$$

If $NE < EE$, then $NE = EE$

$$EC = \sum_{i=1}^n EC_i \text{ where } n = \text{the number of existing engine companies (EE).}$$

I = Percent of built-upon area of the city with first alarm response of at least 2 engine companies to fires in buildings.

I' = Percent of built-upon area of the city with first alarm response of only one engine company to fire in buildings, except in cities where only one engine company is needed.

Note 1: In cities where only one engine company is needed, $I = 100\%$, and $I' = 0$.

Note 2: Reduce 654 to 554 if a heavy stream device is not needed and not credited according to Table 512.A.

520. NUMBER OF NEEDED RESERVE PUMPERS (NRP):

The number of needed reserve pumpers is 1 for each 8 needed engine companies, or any fraction thereof.

When the number of existing engine companies (EE) exceeds the number of needed engine companies (NE), the number of needed reserve pumpers is based upon the number of existing engine companies.

521. EQUIPMENT ON EXISTING RESERVE PUMPERS (RPC_i):

Reserve pumpers are reviewed for pump capacity (PC_i), hose carried (HC_i) and equipment (E_i) in the same manner as described in Item 512. The number of reserve pumpers credited in this item shall not exceed the number of needed reserve pumpers. The value of RPC_i for each reserve pumper shall be determined by the following formula:

$$RPC_i = (PC_i)(HC_i)(E_i)$$

Note: The value of RPC_i shall be reduced 2 percent for each 10 percent that the pumper exceeds the manufacturer's gross vehicle weight rating.

A reserve pumper-ladder or reserve pumper-service truck may be credited in this item as a reserve pumper, or in Item 553 as a reserve ladder or service truck, but not both.

522. OUT OF SERVICE PUMPERS (OSP_i):

The number of existing pumpers considered out of service shall be the number of needed reserve pumpers. In-service apparatus with the largest number of points credited in Item 513 shall be considered out of service.

OSP_i = EC_i for those pumpers considered as out of service.

523. CREDIT FOR RESERVE PUMPERS (CRP):

$$CRP = \frac{EC + RPC - OSP}{654 NE} \times 1$$

If $NE < EE$, then $NE = EE$

$RPC = \sum_{i=1}^n RPC_i$, where n = the number of creditable reserve pumpers from Item 521.

$OSP = \sum_{i=1}^n OSP_i$, where n = the number of pumpers considered out of service (NRP).

Note: Reduce 654 to 554 if a heavy stream device is not needed and not credited according to Table 512.A.

530. PUMP CAPACITY (PC):

The total available pump capacity should be sufficient for the Basic Fire Flow in the city. The pump capacity obtained by test at rated pump pressure, not to exceed rated capacity, may be credited. Credit will be limited to 80 percent of the rated capacity if no test data is available. Less than 80 percent may be credited if other mechanical features of the apparatus indicate a generally poor mechanical performance.

531. REVIEW OF PUMP CAPACITY:

A. Existing Pump Capacity (EP_i):

The pump capacity of in-service pumpers, pumper-ladder and pumper-service trucks that were credited in Item 513 shall be credited in this item.

B. Reserve and Other Pump Capacity (RP_i) and (OP_i):

The creditable capacity of reserve pumpers, and reserve pumper-ladder and pumper-service trucks that were credited in Item 523 shall be credited in this item.

One-half the capacity of permanently-mounted pumps, capable of delivering at least 50 gpm at 150 psi, on other apparatus, reserve pumpers, and reserve pumper-ladder and pumper-service trucks not credited in Items 513 or 523 shall be credited in this item.

C. Automatic-Aid Pumper Capacity (AAP_i):

The capacity of pumpers credited as automatic aid in Item 513 shall not exceed the percent determined by the value of the automatic-aid plan (AA_i) times the creditable pump capacity for each credited automatic-aid pumper.

532. CREDIT FOR PUMPER CAPACITY (CPC):

$$CPC = \frac{(EP + RP + OP + AAP) \text{ up to BFF}}{BFF} \times 5$$

$$EP = \sum_{i=1}^n EP_i \text{ where } n = \text{number of in-service apparatus from Item 513.}$$

$$AAP = \sum_{i=1}^n [(AAP)_i (AA_i)], \text{ where } n = \text{number of automatic-aid pumps.}$$

The value AA_i is from Item 512.D.

$$RP = \sum_{i=1}^n RP_i, \text{ where } n = \text{number of reserve pumpers.}$$

$$OP = \sum_{i=1}^n OP_i, \text{ where } n = \text{number of other apparatus.}$$

540. NUMBER OF NEEDED LADDER COMPANIES (NL):

Response areas with 5 buildings that are 3 stories or 35 feet or more in height, or with 5 buildings that have a Needed Fire Flow greater than 3,500 gpm, or any combination of these criteria, should have a ladder company. The height of all buildings in the city, including those protected by automatic sprinklers, is considered when determining the number of needed ladder companies.

When no individual response district alone needs a ladder company, at least one ladder company is needed if buildings in the city meet the above criteria.

The criteria from Items 510.B and 510.C for the number of needed engine companies also applies to the number of needed ladder companies.

541. NUMBER OF NEEDED SERVICE COMPANIES (NS):

Response areas not needing a ladder company according to Item 540 should have a service company.

542. NUMBER OF EXISTING LADDER COMPANIES (EL):

Companies responding to first alarms carrying any of the equipment listed in Tables 544.A and 544.B shall be considered as existing ladder companies when ladder companies are needed according to Item 540.

An engine-ladder company considered as an existing engine company in Item 511 and carrying any of the equipment listed in Tables 544.A and 544.B shall be considered as 1/2 a ladder company in this item when a ladder company is needed according to Item 540. An engine-ladder company not credited as an engine company in Item 511 and carrying any equipment listed in Tables 544.A and 544.B shall be credited as one ladder company if needed according to Item 540.

543. NUMBER OF EXISTING SERVICE COMPANIES (ES):

Companies responding to first alarms carrying any of the equipment listed in Table 544.A shall be considered as existing service companies when service companies are needed according to Item 541.

An engine-service company considered as an existing engine company in Item 511 and carrying any of the equipment listed in Table 544.A shall be considered as $\frac{1}{2}$ a service company in this item when a service company is needed according to Item 541. An engine-service company not credited as an engine company in Item 511 and carrying any equipment listed in Table 544.A shall be credited as one service company if needed according to Item 541.

544. LADDER COMPANY EQUIPMENT (LCE_i):

The points credit for the equipment on each existing ladder truck considered in Item 542 shall be determined from Tables 544.A, 544.B and 544.C.

545. ENGINE-LADDER COMPANY EQUIPMENT (ELCE_i):

The points credit for the equipment on each existing pumper-ladder truck considered in Items 511 and 542 shall be determined from Tables 544.A, 544.B and 544.C.

546. SERVICE COMPANY EQUIPMENT (SCE_i):

For each building, up to 4, that is at least 3 stories or 35 feet in height, an additional ladder of different length, from Table 544.B, should be carried by the service company. One ladder should be of sufficient length to reach the roof of any building or a 40-foot extension ladder, whichever is less.

The points credit for the equipment on each existing service truck considered in Item 543 shall be determined from Tables 544.A and 544.B.

547. ENGINE-SERVICE COMPANY EQUIPMENT (ESCE_i):

The points credit for the equipment on each existing pumper-service truck considered in Items 511 and 543 shall be determined from Tables 544.A and 544.B.

548. AUTOMATIC AID:

The value of an automatic-aid ladder or service company is the value of the company as determined by Items 544 through 547 multiplied by AA_i from Item 512.D.

TABLE 544.A EQUIPMENT FOR A SERVICE COMPANY

Equipment	Needed	Points Credit/Unit	Total Points
Large Spray Nozzle (500-gpm minimum)	1	16	16
Breathing Equipment (self-contained, 30-minute minimum)	6	16	96
Extra cylinders (carried)	6	4	24
Salvage Covers (12 ft. x 18 ft.)	10	2	20
Electric Generator (2500-watt)	1	25	25
Floodlight (500-watt)	3	4	12
Smoke Ejector	1	20	20
Oxyacetylene Cutting Unit	1	20	20
Saw - Power	1	20	20
Electric Handlight (4V. wet, 6V. dry)	4	2	8
Hose Roller (Equip. Hoist)	1	4	4
Pike Pole (Plaster Hook):			
6-foot	2	2	4
8-foot	2	2	4
12-foot	2	2	4
Radio:			
Mounted	1	32	32
Portable	1	16	16
Ladder:			
10-ft. Collapsible	1	4	4
14-ft. Extension	1	5	5
			Total 334

TABLE 544.B ADDITIONAL EQUIPMENT FOR LADDER COMPANY

Equipment	Needed	Points Credit/Unit	Total Points
Ladder:			
16-ft. Roof	1	20	20
20-ft. Roof	1	20	20
28-ft. Extension	1	20	20
35-ft. Extension	1	20	20
40-ft. Extension	1	20	20
Elevated Stream Device*	1	100	100
Aerial Ladder/Elevating Platform*	1	200	200
Annual Tests (Aerial/Platform, See Table 544.C)	1	50	50
		Total	450

*Of sufficient height to reach the roof of any building, or 100 feet, whichever is less. The credit shall be prorated if existing equipment has insufficient reach.

TABLE 544.C AERIAL LADDER/ELEVATING PLATFORM TESTS

Average Interval Between 3 Most Recent Tests	Maximum Points Credit
1 year	50
2 years	37
3 years	25
4 years	12
5 years or more	0

Tests for aerial ladder and elevating platforms are described in NFPA Standard 1914 – Testing Fire Department Aerial Devices.

Note: If there are no records of tests claimed to have been conducted, reduce the applicable points credit by 20 percent for Table 544.C.

549. CREDIT FOR LADDER SERVICE (CLS):

$$CLS = \frac{LCE + SCE + 0.5(ELCE) + 0.5(ESCE)}{784(NL) + 334(NS) + \dagger} (A) \times 5$$

If $NL < EL$, then $NL = EL$

If $NS < ES$, then $NS = ES$

$LCE = \sum_{i=1}^n LCE_i$, Where n = sum of points for equipment, from Item 544.

$ELCE = \sum_{i=1}^n ELCE_i$, Where n = sum of points for equipment from Item 545.

$SCE = \sum_{i=1}^n SCE_i$, Where n = sum of points for equipment, from Item 546.

$ESCE = \sum_{i=1}^n ESCE_i$, Where n = sum of points for equipment from Item 547.

Note: The value for ladder and service truck equipment (items 544, 545, 546 and 547) shall be reduced by 2 percent for each 10 percent that the truck exceeds the manufacturer's gross vehicle weight rating.

A = Percent of built-upon area of the city with first alarm response of a ladder, service, engine-ladder or engine-service company to fires in buildings.

\dagger Add the assigned points for any additional ladders needed from Table 544.B.

550. NUMBER OF NEEDED RESERVE LADDER SERVICE TRUCKS (NRLS):

The number of needed reserve ladder and service trucks is 1 for each 8 needed ladder and service companies (NLS), or any fraction thereof.

$$NLS = NL + NS$$

When the number of existing ladder and service companies (ELS) exceeds the number of needed ladder and service companies, the number of needed reserve ladder and service trucks is based upon the number of existing ladder and service companies.

$$ELS = EL + ES$$

Note 1: When 8 or less ladder and service companies are needed, and 1 or more ladder companies are needed, the reserve truck should be a ladder truck. When more than 8 ladder companies are needed, there should be a reserve ladder truck for each 8, or fraction thereof.

Note 2: When the number of needed reserve ladder and service trucks exceeds the number of needed reserve ladder trucks, the difference shall be considered as needed reserve service trucks.

551. EQUIPMENT ON RESERVE LADDER AND SERVICE TRUCKS (RLSC_i):

The equipment on credited reserve ladder and service trucks shall be reviewed by application of Tables 544.A, 544.B and 544.C.

Note: The value of RLSC_i shall be reduced 2 percent for each 10 percent that the truck exceeds the manufacturer's gross vehicle weight rating.

The number of reserve ladder and service trucks credited in this item shall not exceed the number of needed reserve ladder and service trucks.

A reserve pumper-ladder or reserve pumper-service truck may be credited in this item as a reserve ladder or service truck, or in Item 523 as a reserve pumper, but not both.

552. OUT OF SERVICE LADDER AND SERVICE TRUCKS (OSLS_i):

The number of in-service ladder and service trucks considered out of service shall be the number of needed reserve ladder and service trucks. The in-service ladder and service trucks credited in Item 549 having the largest number of points (LCE_i and SCE_i) shall be considered out of service.

OSLS_i = LCE_i or SCE_i for those trucks considered out of service.

553. CREDIT FOR RESERVE LADDER AND SERVICE TRUCKS (CRLS):

$$CRLS = \frac{LCE + SCE + 0.5(ELCE) + 0.5(ESCE) + RLSC - OSLS}{784(NL) + 334(NS) + \dagger} \times 1$$

If NL < EL, then NL = EL

If NS < ES, then NS = ES

RLSC = $\sum_{i=1}^n$ RLSC_i, where n = the number of creditable reserve ladder and service trucks from Item 551.

OSLS = $\sum_{i=1}^n$ OSLS_i, where n = number of ladder and service trucks considered out of service.

†Add the assigned points for any additional ladders needed from Table 544.B.

560. DISTRIBUTION OF COMPANIES (DC):

The built-upon area of the city should have a first-due engine company within 1½ miles and a ladder-service company within 2½ miles.

561. CREDIT FOR DISTRIBUTION (CD):

$$CD = \left[\left[\frac{EC}{654(EE)} \times 0.6(AE) \right] + \left[\frac{LCE + SCE + 0.5(ELCE) + 0.5(ESCE)}{784(EL) + 334(ES) + \dagger\dagger} \times 0.4(AL) \right] \right] \times 4$$

AE = The percent of built-upon area within 1½ miles of a first-due engine, engine-ladder or engine-service company.

AL = The percent of the built-upon area within 2½ miles of a ladder, service, engine-ladder or engine-service company.

††Add the assigned points for any additional ladders needed for existing service companies from Table 544.B.

570. EXISTING COMPANY PERSONNEL (ECP):

Existing company personnel is the average number of fire fighters and company officers on duty for existing companies determined by the following criteria:

A. On-Duty Strength (OM):

The total number of members on duty with companies shall be taken as a yearly average considering vacations, sick leave and other absences.

Chiefs' aides shall be included in company strength if they participate in fire-fighting operations. Administrative personnel will not be included in this item.

Members on apparatus not credited under Items 513 and 549 that regularly respond to first alarms to aid engine, ladder and service companies shall be included in this item as increasing total company strength.

Personnel staffing ambulances or other units serving the general public shall be credited if they participate in fire-fighting operations, the number depending upon the extent to which they are available and are used for response to first alarms of fire.

B. Call and Volunteer Members (VM):

Call and volunteer members shall be credited on the basis of the average number staffing apparatus on first alarms. Off-shift paid members responding on first alarms shall be considered on the same basis as call and volunteer members.

Call and volunteer members sleeping at fire stations shall be considered as on-duty members (OM) for the proportional time they are on duty.

C. Automatic-Aid Response:

The average number of personnel responding with those companies credited as automatic aid under Items 513 and 549 shall be considered in A and B above. The actual number to be added to OM and VM is the average number of personnel responding multiplied by the value of AA_i determined in Item 512.D.

D. Special Apparatus:

Personnel responding to first alarms on special apparatus such as squad and salvage trucks shall be considered in A and B above.

E. Service, Pumper-Service and Pumper-Ladder Trucks:

When a service truck has been credited in Item 549, it shall be considered as one existing service company in Item 571. When a pumper-service truck has been credited in Items 513 and 549, it shall be considered as one existing engine company and as one existing service company in Item 571. When a pumper-ladder truck has been credited in Items 513 and 549, it shall be considered as one existing engine company and as one existing ladder company in Item 571.

F. Surplus Companies (SC):

When the number of existing companies exceeds the number of needed companies and the extra companies do **not** form a necessary part of the first alarm response to any location in the city, the extra companies are considered surplus. The personnel responding with surplus companies shall be credited in A and B above.

When there is a difference between day and night shifts, or between days in the week, the credit shall be prorated.

The maximum credit for any response of on-duty, call and volunteer members is 12 fire fighters, including company officers, for each existing engine and ladder company and 6 for each existing service company.

571. CREDIT FOR COMPANY PERSONNEL (CCP):

$$CCP = \frac{OM + VM/3†}{EE + EL + 0.5(ES) - SC} \times 2\frac{1}{2}$$

Note: The number of existing companies shall be adjusted, if necessary, to conform with Item 570.E.

†If satisfactory records of response are not kept, use 6 instead of 3.

580. TRAINING (T):

The credit for training shall be reviewed as follows:

A. Facilities, Aids and Use (T₁₁):

1. Facilities and Aids (FA)

	Points
Drill Tower	8
Fire Building (including smoke room)	8
Combustible Liquid Pit	5
Library and Training Manuals	2
Slide and Movie Projectors and pump and hydrant cutaways	2
Training area (this may include streets or open areas when no other training facilities are provided)	10

2. Use (FU)

Multiply the points credit for facilities and aids by the following factors for use of the facilities and aids by all company members:

	Maximum
a. Half-day (3 hours) drills, 8 per year (0.05 each)	0.40
b. Half-day (3 hours), multiple-company drills, 4 per year (0.10 each)	0.40
c. Night drills (3 hours), 2 per year (0.10 each)	0.20

Note: A single company drill may receive credit under a and c;
a multiple company drill may receive credit under a, b, and c.

$$T_{11} = (FA) (FU)$$

- B. **Company Training (T₁₂):**
Company training at fire stations, 20 hours per member per month, up to 25
- C. **Classes for Officers (T₁₃):**
2 days per year for all officers, up to 15
- D. **Driver and Operator Training (T₁₄):**
4 half-day sessions per year, up to 2
- E. **New Driver and Operator Training (T₁₅):**
Classes for new drivers and operators, 40 hours, up to 2
- F. **Training on Hazardous Materials (T₁₆):**
½ day per member per year 1
- G. **Recruit Training (T₁₇):**
240 hours per recruit, up to 5
- H. **Pre-Fire Planning Inspections (T₁₈):**
Pre-fire planning inspections of each commercial, industrial, institutional and other similar type building should be made twice a year. Records of the inspections should include complete and up-to-date notes and sketches. Use the point credit for frequency of inspections from Item 630 times ¹⁵/₁₀₀.
- I. The sum of points credited in Item 580.A through 580.H shall be reduced by up to 20 points for incomplete records (T₁₉).

581. CREDIT FOR TRAINING (CT):

$$CT = \frac{T}{100} \times 9$$

$$T = \sum_1^9 T_i$$

590. CREDIT FOR FIRE DEPARTMENT (CFD):

$$CFD = CEC + CRP + CPC + CLS + CRLS + CD + CCP + CT$$

WATER SUPPLY

600. GENERAL:

This item reviews the water supply system that is available for fire suppression in the city.

601. PART OF CITY UNPROTECTED:

If any built-on area of the city is not within 1,000 feet of a recognized water system, the unprotected area may receive Class 9 (See Items 801 and 802).

602. MAXIMUM DAILY CONSUMPTION RATE (MDC):

The maximum daily consumption rate is the average rate of consumption on the maximum day. The maximum day is the 24-hour period during which the highest consumption total is recorded in the latest 3-year period. High consumption that will not occur again due to changes in the system, or that was caused by unusual operations, will not be considered.

When no actual figure for maximum daily consumption is available, it will be estimated on the basis of consumption in other cities of similar character and climate. Such estimates will be at least 50 percent greater than the average daily consumption. When a system is in 2 or more service levels, consider the total maximum daily consumption that must pass through the service level being reviewed.

603. MINIMUM PRESSURE:

A water system is reviewed at a residual water pressure of 20 psi.

604. FIRE FLOW AND DURATION:

The fire flow duration should be 2 hours for Needed Fire Flows (NFF_i) up to 2,500 gpm, and 3 hours for Needed Fire Flows of 3,000 and 3,500 gpm.

605. SERVICE LEVEL:

A service level is a part of the city distribution system that is served by one or more sources of supply but that is separated from the remaining distribution system by closed valves, check valves or pressure regulating equipment, or is not connected.

When a system is supplied from 2 or more sources or supply works, the credit shall be based upon the combined protection provided from all sources or supply works.

610. REVIEW OF SUPPLY SYSTEM:

The ability of the water supply system to deliver the Needed Fire Flow (NFF_i) at representative locations throughout the city is reviewed in Items 611 through 616. For each representative location, the supply works, mains, and hydrant distribution are reviewed separately.

611. SUPPLY WORKS:

The absolute minimum supply available from water sources under extreme dry weather conditions should not be taken as the measure of the normal ability of the source of supply. The normal sustained flow of supplies should be used as the normal capacity of the source. If the supply is regularly reduced for a period exceeding one month per year, prorate the available supply by the time available.

A. Minimum Storage (MS_i):

The average daily minimum water storage maintained is the maximum amount that can be credited. For storage floating on the distribution system, only the portion of average daily minimum storage that can be delivered at the required residual pressure, and for the fire duration at the point of use, shall be credited. Minimum Storage (MS) is the sum of all these storages ($MS = \sum MS_i$) available at the test location for the fire duration, expressed in gpm.

For ground or below-ground storage, where the average daily minimum storage must be repumped, the storage is credited, or is limited by pumps under PU_i according to the capacity of the pumping facility for the fire duration.

When a city experiences large seasonal fluctuations of population and therefore wide variations in consumption, the average daily minimum storage will be considered at the time when consumption is average for the maximum population.

B. Pumps (PU_i):

Pumps should be credited at their effective capacities when delivering at normal operating pressures. The effective capacity may be limited by filters, softeners, or other devices in suction or discharge lines, and, when pumping stored water, their effective capacity may be limited by the average minimum daily storage. The total pumping capacity (PU) shall be the sum of all pump facilities ($PU = \sum PU_i$) available at the test location, expressed in gpm.

When there are 2 or more pump lifts in series, the effective pump capacity is the capacity of the lift with the lowest total capacity.

When the same pumps can operate in 2 or more lifts, they shall be credited in each lift to determine the lift with the lowest total capacity.

C. Filters (FL_i):

Filters may be considered as capable of operating at a reasonable overload capacity based on records. When filters limit the capacity of subsequent pumping stages, consider them as a pump capacity limit (PU_i). When filters deliver water directly into the distribution system, without pumping, the total filter capacity (FL) shall be the sum of all filter capacities ($FL = \sum FL_i$) available at the test location, expressed in gpm.

D. Emergency Supply (EM_i):

The ability to utilize emergency supplies through connections from other systems or from separate sources, storage, or equipment not normally used shall be considered in reviewing the system. Credit shall be given for emergency supplies that come in automatically.

Credit will also be given for other emergency supplies when sufficient supply is available on the system being reviewed to maintain the total rate credited during the period that would elapse before delivery is possible from the emergency supplies. The total emergency supply capacity (EM) shall be the sum of all emergency supplies ($EM = \sum EM_i$) available at the test location, expressed in gpm.

E. Suction Supply (SS_i):

Where bays, rivers, canals, streams, ponds, wells, cisterns, or other similar sources are available as suction supply for fire department pumpers, the suction supply shall be considered with respect to its ability, including accessibility, availability during freezing weather, floods, droughts, or other adverse conditions to satisfy the Needed Fire Flow (NFF_i) at test locations. The total suction supply (SS) credited shall be the sum of suction supplies ($SS = \sum SS_i$) at the test location for the fire duration, or the capacity of the fire department pumping equipment, whichever is less, expressed in gpm.

F. Fire Department Supply (FDS):

Supply delivered by fire department vehicles carrying or relaying at least 250 gpm to the fire shall be credited. This application rate shall be obtained within 5 minutes of arrival at the fire site, and shall continue for the fire duration of the Needed Fire Flow (NFF_i). If the rate of flow can be increased within 15 minutes of arrival at the fire site, and can be continued for the fire duration of the Needed Fire Flow, the higher rate will be credited.

The travel time of apparatus shall be calculated from the formula:

$$T = 0.65 + 1.7D$$

T = minutes.

D = miles.

Slower speeds will be used for underpowered apparatus, or apparatus laying hose lines.

The fire department supply (FDS) shall be the capacity of the supply for the fire duration, the capacity of the source pumping equipment, the capacity of the delivery equipment, or the capacity of the final delivery pumping equipment, whichever is least, at the test location, expressed in gpm.

612. SUPPLY WORKS CAPACITY (SWC_i):

Calculate the supply works capacity, considering the fire flow duration, for each representative test location. Express the result in gpm.

$$SWC_{ik} = [(MS + PU + FL + EM) - MDC] + SS + FDS; \text{ for one supply.}$$

Where 2 or more supplies are available at a test location,

$$SWC_i = \sum_{k=1}^n SWC_{ik}, \text{ where } n = \text{the number of supplies.}$$

613. MAIN CAPACITY (MC_i):

The normal ability of the distribution system to deliver Needed Fire Flows (NFF_i) at those test locations considered in Item 612 shall be reviewed. The results of a flow test at a representative test location will indicate the ability of mains to carry water to that location.

If tests are made on 2 or more systems or service levels at the same location, credit will be given for the sum of the test results on each system, or service, up to the limit of supply, for the fire flow duration at that location.

$$MC_i = \text{Tested gpm at 20-psi residual pressure.}$$

614. HYDRANT DISTRIBUTION (HD_i):

This item reviews each hydrant within 1,000 feet of a representative test location, measured as hose can be laid by apparatus, to satisfy the Needed Fire Flow (NFF_i). Credit up to 1,000 gpm from each hydrant within 300 feet of the location, 670 gpm from hydrants within 301 to 600 feet of the location and 250 gpm from hydrants within 601 to 1,000 feet of the location. The normal distribution of hydrants in the vicinity of those test locations considered in Items 612 and 613 shall be evaluated.

When there are 2 or more systems or services distributing water at the same location, credit shall be given on the basis of the joint protection provided by all systems and services available.

- A. Sub-standard type hydrants, with at least one fire department outlet, will be considered if capable of delivering at least 250 gpm.
- B. A cistern or other suction point shall be capable of supplying 250 gpm for at least 2 hours to be recognized.
- C. The maximum credit for a hydrant may be limited by A or B above and shall be limited by the number and size of outlets as follows:

	MAXIMUM CREDIT
At least one pumper outlet	1,000 gpm
Two or more hose outlets, no pumper outlet	750
One hose outlet only	500

HD_{ik} is the creditable capacity for each hydrant within 1,000 feet of the test location, expressed in gpm.

$$HD_i = \sum_{k=1}^n HD_{ik}, \text{ where } n = \text{the number of hydrants within 1,000 feet of the test location.}$$

615. CAPABILITY OF WATER SYSTEM AT TEST LOCATION (TLC_i):

The creditable rate of flow at each test location is the lowest of NFF_i, SWC_i, MC_i or HD_i.

616. CREDIT FOR SUPPLY SYSTEM (CSS):

$$CSS = \frac{TLC}{NFF} \times 35$$

$$TLC = \sum_{i=1}^n TLC_i, \text{ where } n = \text{number of test locations.}$$

$$NFF = \sum_{i=1}^n NFF_i, \text{ where } n = \text{number of test locations.}$$

620. HYDRANTS - SIZE, TYPE AND INSTALLATION (PH):

Prorate points from the following subitems according to the number of hydrants of each type compared with the total number of hydrants.

	Points
A. With 6-inch or larger branch, and a pumper outlet; with or without 2½-inch outlets	100
B. With 6-inch or larger branch, no pumper outlet but 2 or more 2½-inch outlets, or with small foot valve or with small barrel	75
C. With only one 2½ -inch outlet	25
D. With less than 6-inch branch	25
E. Flush type	25
F. Cistern or suction point	25

Note 1: Deduct 2 points for each 10 percent of the hydrants not opening in the direction of the majority, or with operating nuts different from the majority.

Note 2: Deduct 10 points if more than one thread is used for pumper or hose outlets.

Note 3: Maximum points under this item are 100.

621. CREDIT FOR HYDRANTS (CH):

$$CH = \frac{PH}{100} \times 2$$

630. INSPECTION AND CONDITION OF HYDRANTS:

Inspection and condition of hydrants should be in accordance with American Water Works Association Manual M-17 – Installation, Maintenance, and Field Testing of Fire Hydrants.

A. Inspection (HI):

The frequency of inspection is the average time interval between the 3 most recent inspections.

Frequency of Inspections	Points
½ year	100
1 year	80
2 years	65
3 years	55
4 years	45
5 years or more	40

Note 1: The points for inspection frequency shall be reduced by 10 points if the inspections are incomplete. An additional reduction of 10 points shall be made if hydrants are not subjected to full system pressure during inspections. If the inspection of cisterns or suction points does not include actual drafting with a pumper, deduct 40 points.

Note 2: If there are no records of claimed inspections, deduct an additional 20 points.

B. Condition (HF):

Prorate a factor (HF) from the following list of conditions according to the actual condition of hydrants examined compared with the total number examined during the survey:

Condition	Factor
Standard (no leaks, opens easily, conspicuous, well located for use by pumper)	1.0
Usable	0.5
Not Usable	0.0

631. CREDIT FOR INSPECTION AND CONDITION (CIC):

$$CIC = \frac{(HI) \times (HF)}{100} \times 3$$

640. CREDIT FOR WATER SUPPLY (CWS):

$$CWS = CSS + CH + CIC$$

TOTAL CREDIT AND CLASSIFICATION

700. GENERAL:

This item develops the Public Protection Classification number by summarizing the credits developed in Items 400 through 640, and by adjusting for the difference in credit between Items 590 and 640.

701. PUBLIC PROTECTION CLASSIFICATION (PPC):

$$PPC^* = \frac{100 - \{(CFA + CFD + CWS) - 0.5\{I(CWS) - 0.8(CFD)I\}}}{10}$$

*Raise any decimal to the next higher number; e.g., 5.12=6.

CLASS 8B AND CLASS 9 PROTECTION

800. GENERAL:

This item reviews the fire suppression features in cities that comply with Item 106. Cities evaluated under this item must have at least one piece of apparatus meeting the general criteria of NFPA Standard 1901, Automotive Fire Apparatus, with a pump with a rated capacity of 250 gpm or more at 150 psi. Additionally, the city, or part of the city, must not have a water system capable of delivering 250 gpm or more for a period of 2 hours plus consumption at the maximum daily rate at a fire location.

801. CLASS 8B PROTECTION:

A. Receiving and Handling Fire Alarms:

Is eligible for a minimum credit of 5 points under Item 440 (CFA).

B. Fire Department:

Is eligible for a minimum credit of 20 points under Item 590 (CFD).

- Responds with an average of 6 firefighters on first alarm responses to structure fires.
- Conducts a minimum of 24 hours of structural fire fighting training per year for each active firefighter.

C. Water Supply:

The fire department is capable of delivering an uninterrupted fire flow of 200 gpm for 20 minutes beginning within 5 minutes of the first arriving engine company.

- Can deliver the minimum fire flow with only the primary responding fire department and automatic aid fire department(s).
- Can deliver the minimum fire flow to at least 85 percent of the built-upon areas of the city.

802. CLASSIFICATION:

Class 8B shall apply when the city meets the criteria of Items 800 and 801. Refer to Item 810 for cities that do not qualify for Class 8B.

810. GENERAL:

This item reviews the fire department in cities that comply with Items 106 and 201.B, but where Items 300 to 701 do not apply.

811. CLASS 9 PROTECTION:

A. Apparatus:

The fire department shall have at least one piece of apparatus meeting the general criteria of NFPA Standard 1901, Automotive Fire Apparatus. The apparatus shall have a permanently mounted pump capable of delivering 50 gpm or more at 150 psi, and a water tank with at least a 300-gallon capacity.

	Points Credit
B. Records:	
Records should indicate date, time, and location of fires; the number of responding members; meetings; training sessions; and maintenance of apparatus and equipment. A roster of fire department members should be kept up to date.	10
C. Equipment:	
The following equipment should be provided:	
1. At least two 150-foot lengths of 3/4- or 1-inch fire department booster hose, 1 1/2-inch preconnected hose, or the equivalent, each with a nozzle capable of discharging either a spray or a straight stream.	30
2. Two portable fire extinguishers suitable for use on Class A, B, and C fires. The minimum size should be 20 BC rating in dry chemical, 10 BC rating in CO ₂ , and 2A rating in water-type extinguishers.	4
3. One 12-foot ladder with folding hooks.	10
4. One 24-foot extension ladder.	15
5. One pick-head axe.	1
6. Two electric hand lights.	4
7. One pike pole.	2
8. One bolt cutter.	2
9. One claw tool.	1
10. One crowbar.	1

The total value from 811.C. shall be reduced 2 points for each 10 percent that the apparatus exceeds the manufacturer's gross vehicle weight rating.

Note: Apparatus weighing in excess of street or bridge loading maximums may cause a reduction in the credited response area.

The criteria, specifications, and tools listed above are each important in establishing Class 9 protection. However, the specific size and nomenclature of each individual subitem may be subject to local conditions in the city graded. Equipment having other names or different dimensions than indicated in the apparatus specifications shall be credited as a proportional equivalent to the required equipment according to its ability to perform similar fire ground jobs.

812. CLASSIFICATION:

Class 9 shall apply when the city meets the criteria of Items 106 and 201.B, and the fire department receives 70 or more points credit in Item 811. Cities where the fire department receives less credit shall be Class 10.

SECTION II
INDIVIDUAL
PROPERTY
FIRE
SUPPRESSION

SECTION II

GENERAL

900. GENERAL:

This section develops a Public Protection Classification that applies to specifically rated properties that have a Needed Fire Flow (NFF_i) greater than 3,500 gpm.

FIRE DEPARTMENT COMPANIES

1000. FIRE DEPARTMENT COMPANIES (FC):

This item reviews the potential fire company response to a subject building with a Needed Fire Flow (NFF_i) greater than 3,500 gpm. The fire department should have the number of engine companies (NE) and ladder companies (NL) listed in Table 1000 for the Needed Fire Flow at the property considered.

TABLE 1000

Needed Fire Flow (NFF _i) gpm	Number of Engine Companies Needed (NE)	Number of Ladder Companies Needed (NL)
4,000 - 4,500	4	1
5,000 - 5,500	5	2
6,000 - 6,500	6	2
7,000 - 7,500	7	3
8,000 - 8,500	8	3
9,000 - 9,500	9	4
10,000	10	4
11,000	11	4
12,000	12	5

1001. MINIMUM EQUIPMENT:

Each pumper credited shall be at least 35 percent adequate in pumping capacity, hose and major equipment according to Item 512. Each ladder truck credited shall be at least 35 percent adequate in equipment and ladders according to Item 544. Each engine-ladder truck credited shall be at least 35 percent adequate according to Items 512 and 545.

1002. EVALUATION OF FIRE DEPARTMENT COMPANIES (FDC):

Engine and ladder companies shall be credited as follows:

- A. Each creditable engine and ladder company in service in the city shall receive 100 points credit. The maximum credit for an engine-ladder company shall be 150 points.
- B. Each automatic-aid engine and ladder company within 5 miles of the city limits that responds to first or multiple alarms within the city, in accordance with a prearranged plan, may be credited up to 90 points. The actual credit in points will be the factor for the automatic-aid plan determined in Item 512.D times 100. The maximum credit for an engine-ladder company is 135 points. The actual credit in points will be the factor for the automatic-aid plan determined in 512.D times 150.
- C. Each pumper and ladder truck in reserve in the city, creditable in Item 1001, shall receive 50 points credit.
Note: A reserve pumper-ladder truck may be credited as a reserve pumper, or as a reserve ladder truck, but not both.
- D. Each outside-aid engine and ladder company within 15 miles travel distance from the city limits that would respond to the city when called shall receive 30 points credit. The maximum credit for an engine-ladder company shall be 45 points.

$$FDC = A + B + C + D$$

Note: The number of pumpers credited shall not exceed the number specified in Table 1000 for the Needed Fire Flow at the property considered. The number of ladder trucks credited shall not exceed the number specified in Table 1000 for the Needed Fire Flow at the property considered.

1003. CREDIT FOR FIRE DEPARTMENT COMPANIES (CFC):

$$CFC = \frac{FDC}{NE + NL} \times 100$$

WATER SUPPLY SYSTEM

1100. WATER SUPPLY SYSTEM (W):

This item reviews the flow from the water supply system at or near a subject building that has a Needed Fire Flow (NFF_i) greater than 3,500 gpm. A water supply system should be able to deliver the Needed Fire Flow, described in Item 300, for a 4-hour duration, with consumption at the maximum daily rate. Water System capability credited shall not exceed the Needed Fire Flow.

1101. CREDIT FOR WATER SUPPLY SYSTEM (CW):

$$CW = \frac{TLC_i}{NFF_i} \times 100$$

TLC_i = Capability of Water System at Test Location, from Item 615.

CREDIT AND CLASSIFICATION

1200. GENERAL:

The protection class at an individual property is the lower of 2 protection factors; the Fire Department Companies or the Water Supply System.

1210. CREDIT FOR INDIVIDUAL PROPERTY (CIP):

If $CFC \leq CW$, then $CIP = CFC$

If $CFC > CW$, then $CIP = CW$

1211. PUBLIC PROTECTION CLASSIFICATION FOR AN INDIVIDUAL PROPERTY (PPC):

$$PPC^* = \frac{100 - CIP}{10}$$

The Public Protection Classification (PPC) at a subject building shall be the same as that determined in Item 701 for the city, unless PPC indicates a poorer class. In such cases, the poorer class, but not less than Class 9, when the city is Class 9 or better, shall apply to the subject building.

*Raise any decimal to the next higher whole number.