

## **SCOPE**

The Wooster Fire Prevention Bureau has established the following requirements for the submittal of all fire alarm, monitoring and emergency warning systems being installed within the Wooster Division of Fire jurisdiction. These guidelines apply to all new installations and to alterations to existing alarm system(s). All systems being installed shall comply with the most current editions of codes, standards and ordinances as adopted by the State of Ohio and the City of Wooster as enforced by the Wooster Fire Prevention Bureau.

## **PURPOSE**

This handout has been developed in an effort to provide the highest level of service to the citizens of the City of Wooster and to maintain consistency in the Wooster Fire Prevention Bureau's review of fire alarm plans. Also to insure that all fire alarm systems installed meet the minimum requirements of the adopted codes and ordinances and provide information to designers and installers of these systems in order to facilitate the design and installation of these fire alarm systems.

## **CODES & STANDARDS FOR SYSTEM REQUIREMENTS**

Ohio Fire Code (OFC), Ohio Building Code (OBC), Ohio Mechanical Code (OMC), National Fire Protection Association (NFPA) 72, 1999 edition, National Fire Protection Association (NFPA) 70, 2002 edition, Americans With Disabilities Act Accessibility Guidelines (ADAAG) and all referenced Standards.

## **PERMITS**

Permits are required for any of the following work:

1. Installation of a new F/A system.
2. Any alteration to an existing F/A system.
3. Addition to an existing F/A system.
4. Demolition of a part or of a whole F/A system.

The permit fee is \$100.00. Permits are valid for the period of one year. The permit fee covers one plan review and one inspection. Additional plan reviews, inspections or reinspections shall be billed by the amount of time required at the rate of \$50.00 per hour. Permit fees will be collected when plans are submitted for review. Additional fees for plan reviews and/or inspections will be billed after the completion and acceptance of the project.

The permit applicant shall be the installing contractor. All installing contractors shall have a Ohio Fire Marshal's Company Certificate and each installer shall have an Ohio Fire Marshal's Installer Certificate.

Installation, alteration, or demolition of a system shall not commence prior to the approval of plans and the issuance of a permit.

The permit and a Wooster Fire Prevention Bureau approved set of plans shall be kept at the project site until final acceptance test of the system, after which they shall remain in the possession of the owner.

To acquire an installation permit for a fire alarm (F/A) system, submit the following to the Wooster Fire Prevention Bureau, 510 N. Market St., Wooster, Ohio 44691.

## PLAN SUBMITTAL REQUIREMENTS

**Plans not conforming to these minimum requirements will be returned as incomplete.**

1. A completed copy of the Fire Alarm System Permit Application.
2. Completed Wooster Fire Prevention Bureau, Fire Alarm Plan Submittal Check List.
3. Provide two copies of plans and equipment data sheets. Plans and all revisions to the plans shall be dated. All data sheets shall be current and complete. All plans and data sheets shall be clearly legible. The Wooster Fire Prevention Bureau shall retain one set.
4. Highlight at least one set of data sheets (style, type, model, amps, volts, mfg., etc) for all fire alarm equipment to be installed as part of the fire alarm or life safety system(s).
5. Provide current UL listing sheets for all devices and equipment to be installed.
6. Plans shall be legible, scaled and shall contain fire alarm system information only.

**Exception:**

- A. Mechanical duct-smoke detector velocities, smoke/fire dampers, etc. shall be shown on plans.
  - B. Smoke control equipment shall be shown on plans.
  - C. HVAC openings are to be shown on plan
7. Plans shall include a title sheet, notes to installer, an equipment list, a written sequence of operation or functional matrix, a floor plan, a system riser diagram, and secondary power & voltage drop calculations. (Explained in detail on the following pages.)
  8. When making alterations, additions, or deletions to an existing system, all existing devices and equipment shall be shown and properly identified on the floor plan and

system riser (single-line) diagram. If utilizing an existing drawing or portion of a drawing, the area of work shall be highlighted

9. When a non-addressable fire alarm system or addressable fire alarm system connected to non-addressable initiating devices is installed, a permanent zone identification map and labeling shall be provided at the fire alarm control panel and annunciator panel(s). The proposed map and labeling shall be submitted to the Wooster Fire Prevention Bureau for review and approval prior to installation. An acceptable method is to have the map mounted on the wall by the annunciator panel and the fire alarm control unit with a Plexiglas cover protecting the map. A properly installed and programmed fully addressable fire alarm system provided with initiating devices that are all individually addressable does not need to be provided with a zone map. However, a spreadsheet must be submitted indicating point address, type of device and description of device as it appears on the FACP.

Provide a signal schedule to include the following for ADDRESSABLE SYSTEM:

| POINT | TYPE OF SIGNAL | ALPHA NUMERIC NOMENCLATURE | LOCAL FUNCTION | OFF-SITE SIGNAL |
|-------|----------------|----------------------------|----------------|-----------------|
| (A)   | (B)            | (C)                        | (D)            | (E)             |
|       |                |                            |                |                 |
|       |                |                            |                |                 |

(A) POINT – Designation by designer of numeric point

(B) TYPE OF SIGNAL – Alarm, Supervisory or Trouble signal

(C) ALPHA NUMERIC NOMENCLATURE – Type of initiating device (Manual Pull, Sprinkler Water Flow, HVAC Smoke Detector, OS&Y Tamper Switch, PIV Tamper Switch, etc.)

(D) LOCAL FUNCTION – Fire Alarm status (A/V activation, Panel trouble, Panel Supervisory

(E) OFF-SITE SIGNAL- Generic/Specific signal correlating with each point as transmitted to monitoring company.

Provide a signal schedule to include the following information for NON-ADDRESSABLE SYSTEMS:

| ZONE<br><br>(A) | TYPE OF SIGNAL<br><br>(B) | ZONE DESCRIPTION<br><br>(C) | STATUS OF FIRE ALARM SYSTEM<br><br>(D) | OFF - SITE SIGNAL<br><br>(E) |
|-----------------|---------------------------|-----------------------------|--|------------------------------|
|                 |                           |                             |  |                              |
|                 |                           |                             |  |                              |

(A) POINT – Designation by designer of numeric point

(B) TYPE OF SIGNAL – Alarm, Supervisory or Trouble signal

(C) ZONE DESCRIPTION – Floor level or area zone

(D) STATUS OF FIRE ALARM SYSTEM – fire Alarm System status (A/V Activation, Panel Trouble, Panel Supervisory)

(E) OFF-SITE SIGNAL – Generic/specific signal coordinated with each zone as transmitted to monitoring company.

**NOTES:**

Are multiple common signal types grouped to transmit a generic signal to the monitoring service?

Does each point/zone transmit distinctively to the monitoring service?

|                    |
|--------------------|
| <b>TITLE SHEET</b> |
|--------------------|

The following information shall be on the **Title Sheet** of the blueprints under the heading of:

**Wooster Fire Prevention Bureau Required Information:**

1. Project name and address of the project, including the full address of the facility containing the alarm system, name and phone number of the project coordinator and facility owner.

2. A note stating that the design and installation complies with Ohio Fire Code (OFC), Ohio Building Code (OBC), Ohio Mechanical Code (OMC), National Fire Protection Association (NFPA) 72, 1999 edition, National Fire Protection Association (NFPA) 70,

2002 edition, Americans With Disabilities Act Accessibility Guidelines (ADAAG) and all referenced Standards.

3. The building construction type and occupancy classification in accordance with the OBC.

4. Scope of work and why the system is being installed.

5. The designer's full name (no initials, pseudonyms, acronyms, or aliases) listed under the heading, **DESIGNED BY** - followed by the designer's business name, address, signature and designer registration number. [NFPA 72, 1-5.1.3]

6. The installing contractor's name (no initials, pseudonyms, acronyms, or aliases) listed under the heading, **INSTALLING CONTRACTOR** - followed by the installing contractor's business name, address and Company's Ohio Fire Marshal Certificate number and expiration date. [Ohio Fire Code (OFC) FM-500.1]

7. Type of NFPA 72 system provided, i.e., local, auxiliary, remote station, proprietary or central station service. *(Note: Central Station Service shall provide all the services and comply with all the requirements delineated in section 5-2 of NFPA 72, 1996 edition. A protected premise, reporting to a listed central station alone, does not meet the requirements of NFPA 72. Systems that report to a listed central station but do not provide all the services or meet the requirements required in section 5-2 of NFPA 72 shall be classified as a Remote Supervising Station System.)*

8. The performance class and style of each initiating device circuit (IDC), signaling-line circuit (SLC), and notification appliance circuit (NAC). [NFPA 72 3-4.2]

9. The supervising station facility's name, address, phone number and UL or FM listing number.

10. Description of annunciation zone assignments. For addressable devices, provide device addresses.

11. Specify if any other suppression systems are installed or are to be installed in the future, e.g., ancillary extinguishing systems, fire sprinkler systems, etc. [When a facility is equipped with an alarm system, all ancillary systems shall be on a separate zone and supervised at the main fire control panel (The main FACP shall annunciate a general alarm when the ancillary panel has initiated a general alarm condition)].

12. All other pertinent notes.

## NOTES TO INSTALLER

**Provide the following notes verbatim on first page of the plan:**

1. At completion of the project, a copy of “as built” drawings shall be provided to the owner/occupant along with written operating instructions, and maintenance/testing information for the fire alarm system. A 24-hour emergency response phone number, for an alarm company representative shall be permanently installed adjacent to the control panel.
2. After installation and acceptance testing has been completed and witnessed by a Fire Inspector from the Wooster Fire Prevention Bureau, a completed NFPA Certificate of Completion shall be issued from the installing company and provided to the fire department and business owner.
3. All equipment, e.g. automatic detection devices, manual pull stations, duct detectors, etc, shall be located in accordance with their listing(s), and all exterior devices shall be listed for outdoor use. All devices in the attic will be listed for that environment.
4. Manual pull or break glass stations shall be mounted at a height of 42-inches to 48-inches on center from finished floor. Manual pull or break glass stations shall be located not more than 5 feet from the entrance to each exit. Additional manual fire alarm boxes shall be located so that the travel distance to the nearest box does not exceed 200 feet. Manual fire alarm boxes shall be red in color. [OBC 907.3]
5. All valves controlling the water supply for automatic sprinkler systems and water – flow switches on all sprinkler systems shall be electrically supervised. [OBC 903.4]
6. Central Station Monitoring Facility (CSMF) shall be identified on the drawings including the name, address, phone number, and copy of the U.L. or F.M. listing number.
7. Through penetration fire stopping for all fire rated walls, floor/ceilings and assemblies shall have an “F” or “T” rating per the OBC and referenced standards. Fire stopping detail(s) with UL System Number shall be provided on the plans. All fire stopping shall comply with approved “F” and “T” methods. [OBC 711]

## EQUIPMENT LIST

Provide the following information:

1. Provide the model number, manufacturer’s name, description, quantity and symbols to be used (legend) for each device, equipment, and conductors proposed to be installed. *(Note: The Fire Department reserves the right to disallow any listed product due to past performance)*



(without dimensions on the plan, a detector can be easily installed in an inappropriate location.) Plan shall include details showing the installation of exterior and underground fire alarm components, including transitions from exterior to interior.

5. Provide a full “point to point” wiring configuration for each device and the point of connection at the panel. All IDC, SLC, and NAC circuits shall be identified on the plan. When auxiliary power supplies and/or fire control panels are being added to the system, a detailed “point to point” connection between this equipment is required, including relays and modules.

**6. For Existing Fire Alarm System(s)** - Provide a full “point to point”. Only circuit zones affected by the tenant improvement work shall be identified on these drawings. When auxiliary power supplies and/or fire control panels are being added to the system, a detailed “point to point” connection between this equipment is required, including relays and modules. The ancillary devices can be typical detail “point to point.”

7. Provide fire alarm primary power supply details for volts and over-current protection. [NFPA 72-1-5.2.5]

8. The candela rating for each individual visual device shall be identified on the plan. This can be achieved either by placing the candela rating adjacent to the devices or by creating a clear legend to differentiate the candela ratings of the devices. When more than two visual notification appliances are located within the same room or area, such devices shall be synchronized. [NFPA 72 Chapter 4]

9. Identify all areas and rooms on the plan by type of use (office, restroom, storage, warehouse, etc.).

10. Identify zone assignments including “addresses” for addressable system, for all systems. Water flow, supervisory switches, manual pull stations, heat detection, smoke detection, duct detection and system trouble, etc. require separate annunciation. All initiating zones shall be indicated as “Z-1, Z-2, Z-3, etc.”, notification circuits as “N-1, N-2, N-3, etc.”, SLC devices with the address of each device or module. The zone, circuit, and address identification shall be placed adjacent to each device on the specific circuit and at the appropriate end of line device(s). Each address shall be placed adjacent to each device referenced on the plan.

11. Provide conductors and cables schedules on the plan. For example, the wiring schedule shall indicate the type, manufacturer, size, insulation type, solid or stranded wire; number of strands; tinned or untinned, etc. [NFPA 72-1-5.5.4, NEC 760]

## RISER DIAGRAM

Provide the following:

1. Single-line wiring diagram (riser diagram) that shows the interconnection of each device and equipment of the whole system. Indicate wiring sequence, number of devices per zone or circuit and zone assignments or addresses for all devices.
2. **For Existing Fire Alarm System(s)** - Depending on the existing fire alarm design and equipment, this riser may include other floors/areas outside the area of work as well as the entire building(s). This riser diagram shall be updated with each system modification. The objective of this requirement is to afford the plan reviewer enough information to properly evaluate the alarm design and performance for code compliance and equipment listing(s).
3. Candela rating of each strobe.
4. Number of conductors in each wiring segment and the type and size of the wire or conductor to be used.
5. The class and style for initiating, signaling line and notification device circuits.

## CALCULATIONS

1. Voltage drop calculation - calculations shall be provided to verify that the voltage drop in the alarm notification circuits do not exceed **10 percent**. Provide voltage drop calculations for each circuit. Below are two possible methods of calculating voltage drop.

### DISTRIBUTED-LOAD VOLTAGE-DROP ( $V_D$ ) METHOD

| CIRCUIT WIRE GAUGE <u>16</u> PAIR RESISTANCE <u>5.16</u><br>(where wire gauge varies, enter gauge between devices in Column 2) |                    |            |                    |                        |                           |                  |                  |                           |
|--|--------------------|------------|--------------------|------------------------|---------------------------|------------------|------------------|---------------------------|
| STARTING VOLTAGE (24 Volts maximum) <u>24</u>  |                    |            |                    |                        |                           |                  |                  |                           |
| INPUT DATA   |                    |            |                    | CALCULATIONS           |                           |                  |                  |                           |
| Device Number  | Current per Device | Wire Gauge | Pair Length (Feet) | Cumulative Pair Length | Cumulative Device Current | $V_D$ per Device | Cumulative $V_D$ | Volts Available at Device |
| 1  | .123               |            | 50                 | 50                     | .123                      | .280             | .280             | 23.72                     |
| 2  | .123               |            | 100                | 150                    | .246                      | .495             | .775             | 23.22                     |
| 3  | .123               |            | 150                | 300                    | .369                      | .647             | 1.422            | 22.58                     |
| 4  | .105               |            | 75                 | 375                    | .474                      | .275             | 1.697            | 22.30                     |

**LUMPED-LOAD VOLTAGE-DROP (V<sub>D</sub>) METHOD (OPTIONAL)**

| DEVICE CURRENT | NUMBER EACH DEVICE TYPE | CUMULATIVE DEVICE CURRENT | CALCULATIONS                    |       |
|----------------|-------------------------|---------------------------|---------------------------------|-------|
|                |                         |                           |                                 |       |
| .123           | 4                       | .492                      | CIRCUIT WIRE GAUGE              | 14    |
| .105           | 3                       | .315                      | PAIR RESISTANCE(OHMS/1000 FT)   | 5.16  |
| .137           | 2                       | .274                      | TOTAL PAIR LENGTH               | 800   |
|                |                         |                           | TOTAL DEVICE CURRENT            | 1.081 |
|                |                         |                           |                                 |       |
|                | <b>TOTAL</b>            | 1.081                     | <b>LUMPED-LOAD VOLTAGE DROP</b> | 4.462 |

(Device Current X Number Each Device Type = Cumulative Device Current)  
(Pair Resistance X Total Pair Length X Total Device Current = Lumped-Load Voltage Drop)

2. Secondary power calculations- Specify the quantities, models, amps, and watts (for standby and alarm conditions) drawn by all equipment being installed on each circuit. This information shall be included within the battery calculations. Indicate what type of secondary power supply is being provided (battery, generator, etc.). Calculations are to include standby and alarm conditions for 100% load, refer to NFPA 72-1-5.2.6 for required durations. Power supply calculations for FACP, auxiliary power supplies (APS), amplifiers, etc., shall include all components to be installed within each type of equipment (initiating, notifying, signaling, supervisory modules, etc.).

3. **For Existing Fire Alarm System(s)** - The calculation shall also indicate the loads for standby and alarm conditions prior to the system modifications as well as the new calculations resulting from system modifications. Power supply calculations for FACP, auxiliary power supplies (APS), amplifiers, etc., shall include all components to be installed within each type of equipment (initiating, notifying, signaling, supervisory modules, etc.).

**Battery Calculation Example:** A fire alarm control panel is connected to the fire alarm equipment listed below. Determine the minimum amp-hour rating of a battery that serves as the secondary power supply for this alarm system, assuming a requirement of 24 hours and 5 minutes in alarm, and assuming that no lamp tests are performed during the standby period.

| Description                 | Quantity | Amps In Supervision<br>(per hour) | Amps In Alarm<br>(per hour) |
|-----------------------------|----------|-----------------------------------|-----------------------------|
| Control Panel               | 1        | 0.219                             | 0.510                       |
| Output Modules              | 5        | 0.0065                            | 0.04                        |
| Sirens                      | 8        | 0.0                               | 0.55                        |
| Supplementary Relay         | 2        | 0.0                               | 0.045                       |
| Beam Smoke Detection Module | 1        | 0.03                              | 0.076                       |
| Gate Valve Module           | 1        | 0.020                             | 0.22                        |
| Input Module                | 1        | 0.018                             | 0.55                        |
| Horn                        | 10       | 0.0                               | 0.063                       |
| Strobe                      | 6        | 0.0                               | 0.025                       |
| Bells                       | 8        | 0.0                               | 0.063                       |
| Horn Strobe                 | 14       | 0.0                               | 0.50                        |
| Ionization Detectors        | 10       | 0.0001                            | 0.08                        |
| Beam Detector               | 10       | 0.0013                            | 0.06                        |
| Duct Detector               | 4        | 0.008                             | 0.06                        |

Note that the sirens, supplementary, horns, strobes, bells, and horn-strobes draw no power in their standby state; they draw power only when operated in alarm. Ionization detectors, beam detectors, and duct detectors require power in standby to analyze smoke conditions.

Solutions:

A. Battery power requirement in supervision. The amp hours required in supervision is determined by multiplying the quantity of the devices by the amps in supervision, then multiplying that total by the standby time requirement. The total amp-hour requirement in standby is the sum of the amp-hours for each component.

| Description                       | Quantity | Amps In<br>Supervision<br>per Unit | Standby Time<br>Requirement<br>(hours) | Amp-Hours<br>Required |
|-----------------------------------|----------|------------------------------------|--|-----------------------|
| Control Panel                     | 1        | 0.219                              | 24                                     | 5.256                 |
| Output Modules                    | 5        | 0.0065                             | 24                                     | 0.78                  |
| Sirens                            | 8        | 0.0                                | 24                                     | 0.0                   |
| Supplementary Relay               | 2        | 0.0                                | 24                                     | 0.0                   |
| Beam Smoke Detection Module       | 1        | 0.03                               | 24                                     | 0.72                  |
| Gate Valve Module                 | 1        | 0.020                              | 24                                     | 0.48                  |
| Input Module                      | 1        | 0.018                              | 24                                     | 0.432                 |
| Horn                              | 10       | 0.0                                | 24                                     | 0.0                   |
| Strobe                            | 6        | 0.0                                | 24                                     | 0.0                   |
| Bells                             | 8        | 0.0                                | 24                                     | 0.0                   |
| Horn -Strobe                      | 14       | 0.0                                | 24                                     | 0.0                   |
| Ionization Detectors              | 10       | 0.0001                             | 24                                     | 0.024                 |
| Beam Detector                     | 10       | 0.0013                             | 24                                     | 0.312                 |
| Duct Detector                     | 4        | 0.008                              | 24                                     | 0.768                 |
| <b>Total Amp-Hours in Standby</b> |          |                                    |  | <b>8.772</b>          |

B. Battery power requirement in alarm. The amp-hours required in alarm is determined by multiplying the quantity of the devices by the amps in alarm, then multiplying that total by the time requirement. In this case, 5 minutes or 0.0833 hours. The total amp-hour requirement in alarm is the sum of the amp-hours for each component.

| Description                     | Quantity | Amps In Alarm | Alarm Time Requirement (hours) | Amp-Hours Required |
|---------------------------------|----------|---------------|--------------------------------|--------------------|
| Control Panel                   | 1        | 0.510         | 0.0833                         | 0.042              |
| Output Modules                  | 5        | 0.04          | 0.0833                         | 0.017              |
| Sirens                          | 8        | 0.55          | 0.0833                         | 0.367              |
| Supplementary Relay             | 2        | 0.045         | 0.0833                         | 0.007              |
| Beam Smoke Detection Module     | 1        | 0.076         | 0.0833                         | 0.006              |
| Gate Valve Module               | 1        | 0.22          | 0.0833                         | 0.018              |
| Input Module                    | 1        | 0.55          | 0.0833                         | 0.046              |
| Horn                            | 10       | 0.063         | 0.0833                         | 0.052              |
| Strobe                          | 6        | 0.025         | 0.0833                         | 0.012              |
| Bells                           | 8        | 0.063         | 0.0833                         | 0.042              |
| Horn-Strobe                     | 14       | 0.50          | 0.0833                         | 0.583              |
| Ionization Detectors            | 10       | 0.08          | 0.0833                         | 0.067              |
| Beam Detectors                  | 10       | 0.06          | 0.0833                         | 0.050              |
| Duct Detector                   | 4        | 0.06          | 0.0833                         | 0.020              |
| <b>Total Amp-Hours in Alarm</b> |          |               |                                | <b>1.329</b>       |

C. The total battery power requirement is determined by adding the power requirement in supervision to the power requirement in alarm.

|                                  |                        |
|----------------------------------|------------------------|
| Power requirement in supervision | 8.772 amp-hours        |
| Power requirement in alarm       | <u>1.329 amp-hours</u> |
|                                  | 10.101 amp-hours       |

A designer then selects the nearest commercially available battery that is larger than 10.101 amp-hours.

## ATTACHMENTS

Manufacturer's specification sheets (cut sheets) for all devices, equipment, and materials to be used shall be submitted, including the transponder to the supervising station. Highlight on the cut sheet which device or equipment is being used, the listing information, and the application per listing.

## COMPLETION AND ACCEPTANCE TEST

1. The Wooster Fire Prevention Bureau requires a Record of Completion to be prepared and submitted during final inspection. The fire alarm installer can complete a Record of Completion found in Figure 1-6.2 of NFPA 72, 1999 Edition. Parts 1, 2, and 4 through 10 shall be completed after the system is installed and the installation wiring has been checked. Part 3 shall be completed after the operational acceptance tests have been completed.

2. Upon completion of the Fire Alarm System, a full operational test of the system must be conducted with a representative of the Wooster Fire Prevention Bureau present during the test.

- A. Please schedule this test with at least 48 hours notice with the Wooster Fire Prevention Bureau.
- B. Please provide all necessary test equipment (i.e. ladder, two-way radios, canned smoke, device for testing heat detectors, etc.)
- C. After the acceptance test has been completed and witnessed, a completed NFPA Record of Completion shall be provided by the installing company to the Fire Department and to the owner/occupant.
- D. The acceptance test shall include 100 percent of all devices, appliances, interfaced systems, and control functions. The systems must be tested according to NFPA 72, 1999 Edition, Fire Alarm Code, Table 7-2-2. Secondary power supplies must be tested. Any Person performing the test shall be licensed by the Ohio State Fire Marshal Office.
- E. Repeat acceptance testing shall be performed after any of the following:
  - 1. Added or deleted system components
  - 2. Any modification, repair, or adjustment to system hardware or wiring
  - 3. Any change to site-specific software

All components, circuits, system operations, or site specific software function known to be affected by the change or identified by a means that indicates the

system operation changes shall be 100 percent tested. In addition, 10 percent of initiating devices that are not directly affected by the change, up to a maximum of 50 devices, also shall be tested, and correct system operation shall be verified. A revised record of completion in accordance with NFPA 1-6.2.1 shall be prepared to reflect any changes. NFPA 72, Section 7-1.6.2