MODEL CODE
for
Gallery Shooting Ranges
Indoor

The following is a model format for a municipal licensing code for gallery (indoor) shooting ranges. It is based on the premises that a building permit will be required and that compliance with the gallery range code will be one of the conditions for granting that permit. It further assumes that following the construction the facility will be inspected and that the operating permit will be granted only after compliance has been confirmed.

The following model code begins with requirements common to all ranges and ends with a section for special classes of ranges. Explanatory information is in brackets and does not constitute part of the formal code. Key considerations are identified by underlining (italics in printed versions).

Before adopting, the code must be edited to conform to the special requirements (if any) of the licensing authority.

1. General Requirements

1.1. Any gallery range license applicant within this jurisdiction must show intent to comply with these code requirements before a building permit will be granted, and must demonstrate compliance before occupancy in order to receive a license to operate.

1.2. The range is understood to include the entire space enclosed by the building structure in which the discharge of firearms may take place. [The space behind the shooters, however great, is included in the range and must comply.]

1.3. Compliance will be determined from the building plans provided for obtaining the building permit, and from such additional data as may be requested.

1.4. In recognition that special considerations are sometimes involved, the licensing authority may add further requirements as it sees fit. Furthermore, any of the following requirements may be waived or altered if sufficient reason can be shown.

1.5. The primary type of shooting activity that will be conducted must be established for the record. All other shooting activities that might be conducted must also be established. In case of conflict the most severe activity will govern compliance.

1.6. Except as provided in the sections for special ranges the range must be of the fixed firing line type in which the shooters remain at one firing line and the targets are brought back and forth to the target line(s) mechanically.

1.7. Specialized terminology in this code shall be interpreted according to the glossary which follows it. All terminology not included in the glossary shall be interpreted according to Webster's Unabridged International Dictionary, current edition.

2. Site Selection - The range must not constitute a nuisance nor a hazard to its contiguous areas. [These include areas above and below as well as alongside.] It must be established that:

2.1. The owner controls the contiguous areas;

2.2. Or that the zoning or natural configurations of the contiguous areas prevents them from being occupied by sensitive areas. [A sensitive area is an area whose occupants would be disturbed by 40 dB of sound emanating from the range. In general that includes most offices but not industrial or warehouse neighbors.]

2.3. Or that there will not be more than 40 dB of noise emanating from the range into the contiguous areas. [It is suggested that this be determined by a qualified acoustical consultant prior to construction; because failure to comply will prevent issuance of the operating license following construction, and may require costly modifications.]

3. Special Considerations - [The space requirements are determined primarily by the use of the range and are not the purview of this code. However, the following apply.]

3.1. The range must be totally enclosed.

3.2. The length must be sufficiently great that the shooters will never be closer than 35 feet to the bullet trap; [as measured by the longest projection of the bullet trap upon the floor] and sufficient for proper door placement as defined later.

3.3. The width must be sufficient to provide three-foot minimum width shooting points for ranges with shooting separators and five-foot minimum width points for those without separators. [There is no maximum width.]

3.4. The height at the firing line must be eight-foot minimum from floor to ceiling. [The purpose of this requirement is to discourage attempts to build ranges in spaces that cannot be responsibly equipped and supervised.]

3.5. The following regulations apply to doors. [These do not usually countermand fire requirements concerning double egresses. The doors may be behind the firing line. None is required downrange for fire exit because that space is not an occupied area. In those rare cases in which there may be conflict, a variance should

be granted to the fire code, because the range accident potential is enormously more hazardous.]

3.5.1. There shall be no downrange doors into occupied areas. Downrange shall be understood to be from a point three-foot behind the firing line to the bullet trap. If there is more than one firing line the most distant one from the trap governs.

3.5.2. There may be downrange doors into unoccupied areas if human egress is not possible. [This provides for electrical and plumbing cabinets, etc. Of course, it is prudent that these be protected.]

3.5.3. There may be downrange doors into normally unoccupied areas that permit human egress providing that they are equipped with electrical safety devices that will provide an alarm to the firing line if the area is occupied and that will provide an alarm in the area if any of the ordinary range functions are commenced (turning on target lights, target systems, etc.). [This makes possible the use of storage areas that can only be reached through the range.]

3.6. Windows are governed by the following requirements: [Whether noise attenuating, shatterproof or bulletproof is determined by use of the range and is not the purview of this code.]

3.6.1. There shall be no windows into contiguous areas not controlled by the owner. [Some codes have called for bulletproof glass, etc., for windows into the ready room which most ranges have. That is not required by this code. That safeguards only from a catastrophic miss. In view of the minor control it provides over all of the other harm such a discharge can cause, it is considered inappropriate. However, prudent design for particular situations may warrant such materials.]

3.6.2. Downrange windows shall be governed as stipulated for downrange doors.

4. Ballistical Security - The prevention of bullet escape. [The concern is for any external area that might be occupied sometime, even if not ordinarily occupied. It applies to basements under ranges and to lofts above. It also applies to areas that are not contiguous, because fugitive bullets might inflict injury at a great distance.]

4.1. Weapons - It must be established for the record what weapons and ammunition will be used. [It is recognized that ballistical security for a centerfire rifle rnage is much more expensive than for handgun ranges (this category also includes shotguns, rimfire rifles and submachine guns). It is further recognized that the owner is unlikely to allow rifles on a handgun range because of the costly damage they would inflict. Therefore, for practical reasons it is assumed that centerfire rifles will not be used on handgun ranges. However, an assumption must be made that any weapon within each category might be used even though the role of the range restricts weapons. For example, it must be assumed

that magnum handgun rounds might be fired on a range intended for .22 rifle shooting by youth groups. The following is based on the handgun category of ranges. The additional requirements for rifle ranges is covered in the sections on special range requirements.]

4.2. Secure area - If the range is situated so that an escaped bullet cannot fall into or pass through occupiable areas there is no ballistical security requirement for the structure separating the range from such areas. The range design manuals of the regular military services shall govern the amount of secure area required in such cases. [These are extremely unusual today and invite close scrutiny.]

Earth separation of three feet or greater is sufficient to eliminate any ballistical security requirement of the structure in that particular direction.

4.4. Critical zones must be penetration proof for the heaviest ammunition that might be used on the range fired point blank into it (at 90 degrees to the surface). [For the purposes of ballistical security only misdirected shots are considered because properly directed ones will be terminated by the bullet trap. The probability of such shots and their inherent hazard has been balanced against the practical considerations. The following does not protect against catastrophic misses which are primarily the respoosibility of proper range management, not design.]

4.4.1. The horizontal critical zone is any surface that a shooter in any shooting point can hit from 45 degrees downrange on either side to 20 degrees behind him on either side.

4.4.2. The vertical critical zone is any surface that a shooter in any shooting point can hit when facing downrange from straight down to straight up.

5. Constructional Requirements - [The following requirements are illustrative. Other construction is acceptable when evidence is presented by actual firing on equivalent test samples using the heaviest ammunition that might be employed on the range.]

5.1. Wall construction

5.1.1. Walls in the critical zone may be standard grade concrete blocks with their cavities filled with crushed rock of 3/4" or smaller screen. Sand is not acceptable. Concrete of any density is acceptable as the fill. Other suitable constructions are: 4" of reinforced concrete, 1/4" of mild steel over an appropriate supporting surface, single layer of face brick.

5.1.2. Walls in the secondary zone may be standard grade concrete blocks without filled cavities. Other suitable constructions are: 3" of reinforced concrete, 1/8" of mild steel over an appropriate supporting surface. Wood planking, plywood and

gypsum board may be used in sufficient thicknesses to be ballistically equivalent, but may result in excessive maintenance.

Wall baffles may be used in lieu of the above constructions for either zone. When used there is no ballistical security requirement for the walls. [The baffles are vertical steel members angled out from the side walls.] When used the following requirements must be met:

(1) The baffles must shelter the wall so that misdirected shots from all shooting points are interrupted by the baffles before striking the wall.

(2) The baffles must be so angled that no bullet may hit any baffle at a greater angle than 45 degrees.

(3) The baffle steel must be of sufficient thickness that it is not dented by the heaviest ammunition if left bare. Or if covered with a wood surface it must be of sufficient thickness that even if dented its structural integrity is maintained. (Note - see later requirements for wood facings.)

Floor construction

In the critical zone floors shall be reinforced concrete of 4" minimum thickness. [The minimum thickness for the other floors is determined by the structural needs of the building and exceeds that required for ballistical security.]

In new construction the floor shall be graded to a downrange floor drain.

Ceiling and roof construction [Two cases are encountered. Least common is the slab roof or ceiling. In most cases the need to protect beams, lights, conduits, ducts, etc., require a series of protective guards. In some cases both may be used on the same range.]

Exposed slab ceiling or roof must be governed by the same requirements as floors. If the bottom surface of the slab is not smooth the following shall govern.

Ceiling baffles must be provided to protect any item that may interrupt the downrange travel of bullets from an angle of 45 degrees to the vertical ahead of the shooter to the bullet trap.

If the ceiling baffles protect the entire overhead area (each baffle starting its protection where the previous one left off) then there is no ballistical security requirement for the ceiling or roof above.

The baffle construction must otherwise comply with the requirements for wall baffles.

5.4. Columns, pilasters, exposed piping and other protuberances downrange shall be protected from damage and prevented from causing ricochets.

5.4.1. Angled steel plates may be used for all protuberances. The requirements for wall baffles shall govern.

5.4.2. Pilasters may be faired to the wall with concrete so that the angle to the wall of the surface of the fairing concrete is 30 degrees or less.

5.5. Plumbing [for flushing out the unburned gunpowder.]

5.5.1. In new construction there shall be a floor drain downrange and a hose bib in the range area.

5.5.2. In existing construction the floor drain may be waived if a slop sink is located within 50 feet of the range.

5.6. Wood facings are not allowed for protection of surfaces unless they are separated from any hard surface (steel or masonry) behind them by an air space of at least one inch.

Noise Attenuation - [Even the best ear-protectors only reduce the level of the loudest ammunition to about the maximum permissable level of OSHA regulations. Therefore, some noise attenuation is required. The amount required is not as great as in some earlier codes because it would be considered irresponsible today to allow anyone to be present in a range during shooting who does not have hearing protection.]

The maximum noise that may excape the range into areas not controlled by the owner is 40 dB. [The use of absorptive materials in the range has little effect upon noise transmission out of the range. Therefore, expert advice is required.]

Sufficient acoustical treatment shall be provided to reduce the sound level from magnum ammunition by 10 dB minimum. [This usually may be met by acoustical treatment of 20 to 25 percent of the celling and wall surfaces.]

Acoustical materials subject to splaying (i.e., the sprayed on type) shall not be used.

Ventilation - [Both health and comfort considerations are involved. Energy conservation requirements may conflict with the health requirements. Therefore, professional consultation is mandatory. Several systems of ventilation are feasible. The code is limited to requirements common to all.]

The permissable exposure to toxic lead products of gunfire shall be governed by current U.S. Department of Labor standards. [The current standard is UDOL 29 CFR 1910.93(b), Table G-2. It limits lead to 0.2 milligrams per cubic meter of air based on an eight-hour time-weighted average. This is subject to change.]

There must be positive flow of air past the shooter in a downrange direction, with all exhaust downrange.

The minimum operating temperature shall be 50 degrees Farenheit and the maximum 90 degrees Farenheit.

Lighting - [Although proper lighting is essential for efficient operation, it is only the purview of the code to the extent that it effects safety.]

There shall be general illumination in the firing line area of 30 MFC as measured at the floor. The minimum downrange general illumination shall be 10 MFC at the floor. [This is obviously not adequate for target illumination which is usually 100 MFC at the target face.]

At least one circuit must be on dual switches so that it may be turned on from the door. [To prevent weapons carrying personnel from groping around in the darkened range.]

There shall be emergency lighting that will automatically illuminate if the lights fail. This must be on standby power.

Equipment Selection - [It is not the intent of the code to foster the use of proprietary range equipment. The owner is free to purchase or fabricate his own as best suits his purpose. The exception is the bullet trap.]

Bullet traps - Locally fabricated plate-and-pit backstops are the chief cause of equipment induced range accidents. Modern bullet traps involve complex considerations that are beyond the capability of the authority to evaluate even if believed to be adequate by the local fabricator. Therefore, the bullet trap shall be from an established manufacturer of range equipment with five years or more successful experience, and for which evidence is submitted of successful applications in other ranges of the same general type.

The bullet trap shall be an area type: i.e., a trap that covers the entire butts end of the range.

The butts end of the range is defined as the total space between the two side walls and from the floor to the sheltered area created by the ceiling system; or in the case of a flat slab roof, up to that roof.

Shooting separators - [The requirements concerning size, and penetration resistance found in previous codes have been omitted. The principal safety contribution of shooting stalls is that they organize the firing line. The incidence of crossrange accidents is insufficient for mandatory requirements. Furthermore, the limitations imposed by separators intended to be secure from such accidents may create even greater hazards. The size, finish and penetration resistance are left to the owner, his professional architect or engineer, and the equipment manufacturer to determine as best suits their purposes.]

9.2.1. All ranges shall have physical separation between the shooting points unless positive reasons are established to show that this cannot be provided. [Dual use of the area is not an acceptable reason unless it can be shown that there is no other way the secondary activity can be conducted.]

9.2.2. The separators shall be structurally sound and functional for the type of range.

9.2.3. The separators shall be so designed that any misdirected shot 60 degrees to the right or left of a shooter that hits any portion of the stall will be deflected downrange without further interruption to its line of travel that may cause ricochet back towards the shooters.

9.3. Target Retrieval System

9.3.1. A mechanical means for transporting the targets between the firing line and the one or more target lines shall be provided.

9.3.2. All portions of the target retrieval system(s) that may be hit by a shooter(s) from an angle of 60 degrees to the vertical to its furthest end are to be armored to prevent damage and suitably angled to redirect the bullets downrange. [This includes the target carrying car, any tracks that may be used, and all supporting hardware.]

9.3.3. If electrically powered the target system shall not have any high voltage (over 50 volt) wiring extending downrange of the firing line; and all metal parts shall be earth grounded.

9.3.4. Any controls beyond the shooting point (i.e., to a rangemaster's control console) shall be on low voltage circuits.

10. Special Requirements

10.1. Rifle ranges - [Centerfire rifles, not required for rimfire rifles.] The minimum ballistical security requirements shall be increased to 6" of reinforced concrete in the critical zone and 4" elsewhere. [Applies to all separating surfaces except those backed by earth or an adequate secure area.]

10.2. Crime laboratory ranges - The stipulations for protection of ceiling and wall protuberances are not required.

10.3. Advanced training ranges [on which courses are conducted downrange of the firing line] require that the ballistical security considerations be planned from each of the various lines along which shooting will take place.

10.4. Carnival type ranges do not come under the requirements of this code providing they are used only with frangible .22 caliber ammunition in smooth bore weapons.