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(आई एस 15369 का दूसरा पुनरीक्षण)

Draft Indian Standard

**CONSTRUCTION OF VAULT (STRONG ROOM)
— CODE OF PRACTICE**

(Second Revision of IS 15369)

ICS 13.310

Security Equipment
Sectional Committee, MED 24

Last date for receipt of
comments is **31 July 2024**

FOREWORD

(Formal clause to be added later)

Vault (strong room) play a very important role in protecting cash, jewellery and other valuables against the threat of burglary attacks and fire. While equipment like safes, lockers and record protection cabinets protect the contents to a certain degree of security, the vault protects this equipment and enhances the degree of security to the contents of these equipments. Thus, vault is a peripheral security arrangement, which is a must, where the risk levels are high.

This standard was first published in 2003 and revised in 2017. The standard is being revised again for incorporating the modifications found necessary as a result of experience gained with the use of this standard. Also the major changes in the standard with this revision are given below:

- a) Dimension of fig. 2 and fig. 4 have been refined; and
- b) Amendment No. 1 has been incorporated.

IS 11188 (Part 1) ‘Vault (strong room) doors: Part 1 Specification’ specifies five classes of vault doors in the increasing degree of security levels. The vaults are also classified in the increasing level of security, which will be compatible with the five classed of doors. This will provide the meaningful quantum jump in the security offered by the vaults for the benefit and

the choices of the user. This is because finally the external conditions such as remote location, rare or frequent policing; normal or terrorist hit area, as also the amount of wealth to be protected shall define the exact risk level. The selection of the vault and the door to be fitted shall therefore be best decided by the user after assessing actual risk level.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (second revision)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

**CONSTRUCTION OF VAULT (STRONG-ROOM) —
CODE OF PRACTICE**

(*Second Revision*)

1 SCOPE

This standard lays down the requirements regarding sizes, materials, and details of construction of various classes of vault and their recommended use.

2 REFERENCES

The standards listed in Annex A have been referred in this standard. At the time of publication, the editions indicated were valid. All the standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 CLASSIFICATION AND RECOMMENDED USE

The vaults shall be of five classes. The recommended use and door to be installed shall be as per Table 1.

4 SIZES

The vault size for Class-‘C’ vault shall be denoted by its internal clear dimensions as specified in Table 1. For all other classes of vaults, size shall be user specified.

5 DESIGNATION

Vault shall generally be designated by its class, the number of this Indian Standard and size wherever applicable. Vault is a structure fabricated out of mild steel plates /constructed reinforced cement concrete fortified with tang bars structure for storage of precious, valuable things safely and with security.

Currency chest vault is a depository for storage of currency only constructed in reinforced cement concrete structure fortified with tang bars. The currency chest vault will be constructed in AAA and B class categories only.

6 MATERIALS OF CONSTRUCTION AND GENERAL REQUIREMENTS

The general layout of a vault shall be as shown in Fig. 1. Except for Class ‘C’ vault for all other vaults, the walls, floor and ceiling shall be reinforced cement concrete. For the vaults of Class ‘A’, ‘AA’ and ‘AAA’ walls, flooring and ceiling shall be further fortified by 1, 2 and 3 rows of 230 mm wide twisted tang bars respectively. The tang bars shall be as specified in 8 (*see* Fig. 2). The detailed requirements in respect of each class shall be as given in 6.1, 6.2, 6.3, 6.4 and 6.5.

6.1 Class ‘C’ Vault

6.1.1 The Class ‘C’ vault is of portable type and shall be constructed from mild steel plates lined with fire resisting insulation blocks/bricks [*see* 3, 4, 8 and 9 of IS 2185 (Part 3)]. Main door shall be of Class ‘C’ as per IS 11188 (Part 1)

6.1.2 All six sides of the Class ‘C’ vault shall be made from minimum 10 mm nominal thickness mild steel plates having ultimate tensile strength more than 270 MPa (*see* IS 1079, IS 2062, and IS 5986). The plates shall be connected to each other by minimum 10 mm bolts or counter sunk screws at pitch not exceeding 200 mm centre-to-centre. The joining method shall be such that the bolts or counter sunk screws are not traceable when viewed externally or accessible from outside. The nominal thickness of joining member made of mild steel shall not be less than 10 mm nominal.

6.1.3 All surfaces of the steel plates and structural members shall be painted. Before applying finish paint, an appropriate primer and undercoating shall be used in accordance to industry practices. The minimum overall thickness of the paint coating shall be 70 microns. Cross hatch test shall be conducted to conform the adhesion of coating in accordance with **6.1.3.1**.

6.1.3.1 *Cross hatch test*

- a) Make 6 parallel cut marks using sharp metal pointer and straight edge, through the painted/ coated surface, so as to make the base surface visible through cut marks.
- b) Cut marks shall be minimum 20 mm long and at 2 mm distance from each other.
- c) Make 6 similar cut marks in the direction perpendicular to first set of cut marks, with same length and spacing.
- d) These 12 cut marks together shall make a pattern of 25 squares of 2 mm × 2 mm size, totally separated from each other.
- e) A good quality transparent adhesive tape not less than 20 mm width, shall be stuck on the pattern, parallel to any one set of cut marks.
- f) To ensure continuous contact with paint/ coat film, rub the tape firmly and remove air bubbles under the tape, if any.
- g) Within 60 to 120 s after sticking the tape, remove it by seizing free end of the tape and rapidly pulling it off at an angle close to 180°.
- h) Painting/Coating quality is considered as acceptable if no part of any 2 mm × 2 mm square of paint/coat comes off the surface due to pulling the tape.

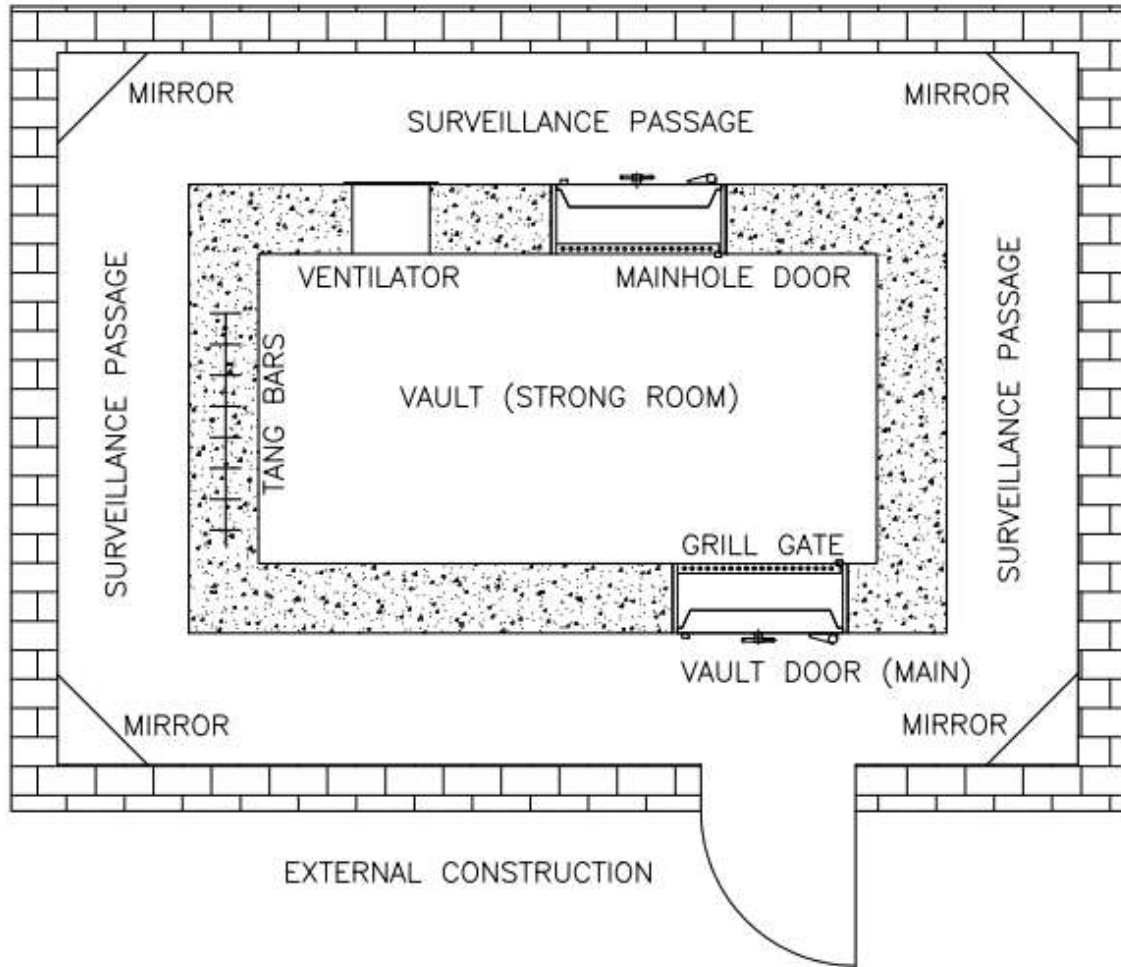


FIG. 1 GENERAL LAYOUT OF VAULT (STRONG ROOM)

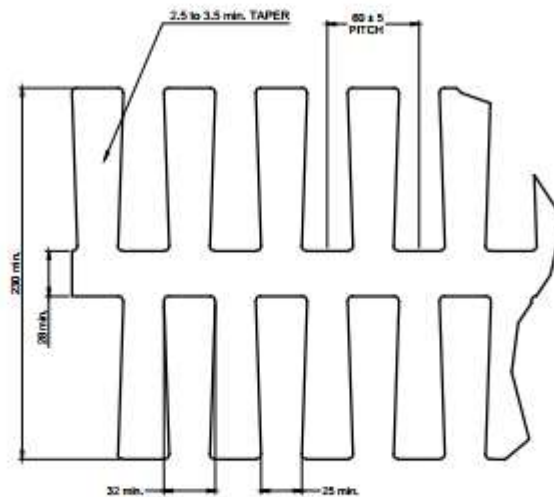
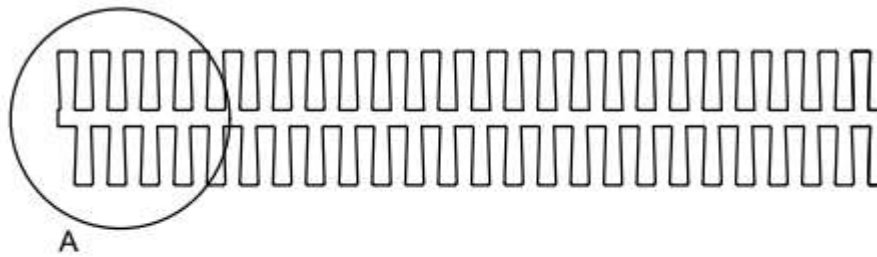
Table 1 Classification of Vaults (Clauses 3, 4 and 6.1.6, 6.2.6, 6.3.6, 6.4.6 and 6.5.6) All dimensions in millimeter						
Vault Class		C	B	A	AA	AAA
Recommended Application	Wealth Level	Low	Medium	Medium	Medium	High
	Risk Level	Low	Low	Medium	High	High
Recommended Main Door and Emergency Door [See IS 11188 (part 1)]	Minimum	Class 'C'	Class 'B'	Class 'A'	Class 'AA'	Class 'AAA'
Recommended internal clear usable size without obstruction (H × W × D)	Tolerance on dimensions ± 2%	2450 × 3350 × 2450 2450 × 4575 × 2450 2450 × 4575 × 4880	As required by the user	As required by the user	As required by the user	As required by the user
Construction	Wall Thickness		300 min	450 min	450 min	450* min
	Floor and Roof		300 min	300 min	450 min	450* min
	Concrete Mix (see IS 456)		M 50 min	M 20 min	M 20 min	M 50** min
	Steel Bar dia.(minimum)	with Fire resistance insulation	12	16	16	20

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	Grid Mesh		150 × 150 × 150 CTC	200 × 200 × 200 CTC	200 × 200 × 200 CTC	200 × 200 × 200 CTC
	Tang Bars, Min		Optional	1 Row	2 Row	3 Row
Surveillance Passage		760 min for all sides	1150 min for front and back, 760 min for sides			
Ventilator	Height from ground level	2100 Min				
	Minimum size	450 mm x 450 mm				

NOTE – 600* mm thickness and M60** Grade concrete in case of Places near international border i.e. within 80 kms from international border or other insurgency effected areas considered by MHA/ GOI/ State Govts.

The normal structural reinforcement required for the roof, walls and floor be designed in consultation with a qualified structural consultant considering minimum reinforcement as per the above specifications.



ENLARGE VIEW AT "A"
 All Dimensions are in Millimeter.

FIG. 2 TYPICAL UNTWISTED FORM OF TANG BAR

6.1.4 Except for door area, the entire Class ‘C’ vault shall be covered with fire resisting blocks/bricks [see 3, 4, 8 and 9 of IS 2185 (Part 3)] on all four sides and complete ceiling. The

total protection of bricks/blocks shall be minimum 230 mm thick for sides and minimum 150 mm thick for ceiling.

6.1.5 Surveillance

There must be a surveillance space of minimum 600 mm wide between Class 'C' vault and the outside construction and the same shall be accessible to the guards on duty on all sides except for the passage connecting the vault door to the external door where the passage shall be wide to permit manoeuvring of the trolleys. Class 'C' vault shall be fitted with Class 'C' main door as specified in IS 11188 (Part 1).

6.1.6 Class of ventilator should be as per Table 1. Recommended standard minimum clear internal sizes for Class 'C' vault are 2 450 mm height × 3 350 mm width × 2 450 mm depth. If required by purchaser, the sizes can vary to suit the available space.

6.1.7 Alternate Construction

Alternatively, the vault of class C can be built using modular vault panels on all six sides, having burglary resistance in accordance with class C specifications as mentioned in IS 11188 (Part 1). [See IS 17541]

6.2 Class 'B' Vault

6.2.1 Walls

Walls of the Class 'B' vault shall be of reinforced concrete of grade minimum M 50 as per **6** and **9.2** of IS 456 and shall be of minimum thickness 300 mm. The reinforcement shall be of mild steel rods of minimum 12 mm nominal diameter having Ultimate Tensile Strength more than 270 MPa (*see* IS 9550 and IS 1732), placed vertically and horizontally at 150 mm centre to centre distance to form mesh and two meshes shall be staggered apart in such a way that the reinforcement bars shall be at every 75 mm centre to centre in cross section.

6.2.2 Floor and Roof

Floor and roof shall be of reinforced concrete of M 50 as per **6** and **9.2** of IS 456 and of minimum 300 mm thickness. The reinforcement shall be of same structure as of wall, namely two-way doubly reinforced with minimum 12 mm nominal diameter mild steel rods having Ultimate Tensile Strength more than 270 MPa (*see* IS 9550 and IS 1732) with staggered arrangement.

6.2.3 Main Door

The recommended door for Class 'B' vault is Class 'B' main door as per IS 11188 (Part 1).

6.2.4 Emergency Door

The recommended emergency door for Class 'B' vault shall be of identical security level as the main door, namely Class 'B' emergency door as per IS 11188 (Part 1).

6.2.5 Surveillance

The surveillance space of minimum 760 mm width shall be kept on all sides around the class B vault if, the premises around the vault is not under users possession. The passage space on the side where main door is provided shall be widened to permit manoeuvring of the trolleys.

6.2.6 Ventilation

Class of ventilator should be as per Table 1. If required, ventilator shall be provided as per IS 14387 and placed high enough (2 100 mm) on the wall for efficient ventilation minimum size (450 mm x 450 mm). Alternatively, emergency door given in 6.2.4 along with plenum chamber attachment may be used for ventilation.

6.2.7 Alternate Construction

Alternatively, the vault of Class 'B' can be built using modular vault panels on all six sides, having burglary resistance in accordance with class B specifications as mentioned in IS 11188 (Part 2). [See IS 17541]. The modular vault shall be free from any seepage from the joints.

6.3 Class 'A' Vault

6.3.1 Walls

Walls of the Class 'A' vault shall be of reinforced concrete of minimum M 20 grade as per 6 and 9.2 of IS 456 and of minimum 450 mm thickness. The reinforcement shall be of mild steel rods of minimum 16 mm nominal diameter having ultimate tensile strength more than 270 MPa (see IS 1732 or IS 9550), placed vertically and horizontally at 200 mm centre to-centre distance to form mesh and two meshes shall be staggered in such a way that the reinforcement bars shall be at every 100 mm in cross-section. The walls shall be further fortified with nominal 230 mm wide x 3 mm thick twisted tang bars (see 8) in single row.

6.3.2 Floor and Roof

Floor and roof shall be reinforced concrete of minimum M 20 grade as per 6 and 9.2 of IS 456 and of minimum 300 mm thickness. The reinforcement shall be of same structure as of wall, namely two-way doubly reinforced with minimum 16 mm nominal diameter mild steel rods having ultimate tensile strength more than 270 MPa (see IS 9550 or IS 1732), with staggered arrangement and single row of tang bars.

6.3.3 Main Door

The recommended door for Class 'A' vault is Class 'A' main door as per IS 11188 (Part 1).

6.3.4 Emergency Door

The recommended emergency door for Class 'A' vault shall be of identical security level as the main door, namely Class 'A' emergency door as per IS 11188 (Part 1).

6.3.5 Surveillance

The surveillance space of minimum 760 mm width shall be kept on all sides around the Class 'A' vault if the premises around the vault are not under user possession. The passage space on the side where main door is provided shall be widened to permit manoeuvring of the trolleys.

6.3.6 Ventilation

Class of ventilator should be as per Table 1. If required, ventilator shall be provided as per IS 14387 and placed high enough on the wall for efficient ventilation. Alternatively, emergency door given in 6.3.4 along with plenum chamber attachment may be used for ventilation.

6.3.7 Alternate Construction

Alternatively, the vault of class A can be built using modular vault panels on all six sides, having burglary resistance in accordance with class A specifications as mentioned in IS 11188 (Part 1). [See IS 17541]

6.4 Class 'AA' Vault

6.4.1 Walls

Walls of the Class 'AA' vault shall be of reinforced concrete of minimum M 20 grade as per 6 and 9.2 of IS 456 and minimum 450 mm thick. The reinforcement shall be of mild steel rods of minimum 16 mm nominal diameter having ultimate tensile strength more than 270 MPa (*see* IS 9550 or IS 1732) placed vertically and horizontally at 200 mm centre-to-centre distance to form mesh and two meshes shall be staggered in such a way that the reinforcement bars shall be at every 100 mm in cross-section. The reinforcement shall be further fortified with nominal 230 mm wide × 3 mm thick twisted tang bars (*see* 8) in two rows.

6.4.2 Floor and Roof

Floor and roof shall be reinforced concrete of minimum M 20 grade as per 6 and 9.2 of IS 456 and minimum 450 mm thick. The reinforcement shall be of same structure as of wall, namely two-way doubly reinforced with minimum 16 mm nominal diameter mild steel rods having ultimate tensile strength more than 270 MPa (*see* IS 9550 or IS 1732) and two rows of twisted tang bars.

6.4.3 Main Door

The recommended door for Class 'AA' vault is Class 'AA' main door as per IS 11188 (Part 1).

6.4.4 Emergency Door

The recommended emergency door for Class 'AA' vault shall be of identical security level as the main door, namely Class 'AA' emergency door as per IS 11188 (Part 1).

6.4.5 Surveillance

The surveillance space of 760 mm wide around the Class 'AA' vault shall be kept. The passage space on the side where main door is provided shall be widened to permit manoeuvring of the trolleys.

6.4.6 Ventilation

Class of ventilator should be as per Table 1. If required, ventilator shall be provided as per IS 14387 and placed high enough on the wall for efficient ventilation. Alternatively emergency door given in 6.4.4 along with plenum chamber attachment may be used for ventilation.

6.4.7 Alternate Construction

Alternatively, the vault of class AA can be built using modular vault panels on all six sides, having burglary resistance in accordance with class AA specifications as mentioned in IS 11188 (Part 1). [See IS 17541]

6.5 Class 'AAA' Vault

Minimum Internal clear usable area without obstruction 139.40 sqm (1500 sqft) for Metro cities and 55.76 sqm (600 sqft) for places near International borders i.e within 80 kms.

6.5.1 Walls

Walls of the Class 'AAA' vault shall be of reinforced concrete of minimum M60 grade for places near International borders i.e within 80 kms and M50 grade for CCs at other centres as per 6 and 9.2 of IS 456 and minimum of 600 mm thick for places near International borders i.e within 80 kms and 450 mm thick for CCs at other centres. The reinforcement shall be of mild steel rods of minimum 20 mm nominal diameter having ultimate tensile strength more than 270 MPa (*see* IS 9550 or IS 1732) placed vertically and horizontally at 200 mm centre to centre distance staggered to form mesh and two meshes shall be in such a way so that the reinforcement bars shall be at every 100 mm in cross-section. The reinforcement shall be further fortified with nominal 230 mm wide × 3 mm thick twisted tang bars (*see* 8 for further details of tang bars) in three rows.

6.5.2 Floor and Roof

Floor and roof shall be of reinforced concrete of minimum M60 grade for places near International borders i.e within 80 kms and M 50 grade for CCs at other centres and as per 6 and 9.2 of IS 456 and minimum 600 mm thick for places near International borders i.e within 80 kms and 450 mm thick for CCs at other centres. The reinforcement shall be of same structure as that of wall, namely two-way doubly reinforced with minimum 20 mm nominal diameter mild steel rods having ultimate tensile strength more than 270 MPa (IS 9550 or IS 1732) with staggered arrangement and three rows of twisted tang bars.

6.5.3 Main Door

The recommended door for Class 'AAA' vault is class 'AAA' main door as per IS 11188 (Part 1).

6.5.4 Emergency Door

The recommended emergency door for Class ‘AAA’ vault shall be of identical security level as the main door, namely Class ‘AAA’ emergency door as per IS 11188 (Part 1).

6.5.5 Surveillance

The surveillance space of 1150 min for front and back, 760 min wide for sides shall be kept for the Class ‘AAA’ vault. The passage space on the side where main door is provided shall be widened to permit manoeuvring of the trolleys.

6.5.6 Ventilation

Class of ventilator should be as per Table 1. If required, ventilator shall be provided as per IS 14387 and placed high enough (2 100 mm) on the wall for efficient ventilation minimum size (450 mm x 450 mm). Alternatively, emergency door given in 6.5.4 along with plenum chamber attachment may be used for ventilation.

6.5.7 Alternate Construction

Alternatively, the vault of class AAA can be built using modular vault panels on all six sides, having burglary resistance in accordance with class AAA specifications as mentioned in IS 11188 (Part 1). [See IS 17541]. The modular vault shall be free from any seepage from the joints.

6.6 Larger size vaults

Larger size vaults amenable for adoption of automation, vault shall not have any obstruction viz. columns etc. within the carpet area, it shall have minimum 9.0 m clear height (from finished floor slab to finished roof slab) and structural design of floor slab shall be suitable to minimum 5000 kg per sqm imposed load (rolling / moving / stacked). The reinforcement shall be of same structure as that of wall, namely two-way doubly reinforced with minimum 20 mm nominal diameter mild steel rods having ultimate tensile strength more than 270 MPa (IS 9550 or IS 1732) with staggered arrangement and three rows of twisted tang bars.

6.6.1 Walls, Floor and Roof

Minimum M 60 grade of RCC and 20 mm diameter reinforcement both ways @ 200 mm centre to centre on both faces shall be used for construction of vault. The reinforcement shall be of same structure as that of wall, namely two-way doubly reinforced with minimum 20 mm nominal diameter mild steel rods having ultimate tensile strength more than 270 MPa (IS 9550 or IS 1732) with staggered arrangement and three rows of twisted tang bars.

6.6.2 Main Door

It shall have two main doors with 2.1 m x 2.45 m size each. Though the door sizes may not be the standard size as mentioned in the IS 11188 (part 1), all other specifications of doors shall be conforming to the specifications stipulated in IS 11188 – Part 1 (latest updated version).

6.6.3 Ventilation

Ventilation within the vault shall be provided through plenum space/chamber designed such that the supply and return air ducts shall not pose any security concern to vault while facilitating cooling and ventilation into the vault. Specifications of doors to plenum chamber openings in vaults shall be like main doors of vault.

6.6.4 Surveillance

Surveillance passages around vaults to be minimum 3 to 3.5 m in front of vault doors and minimum 1.6 m to 1.75 m all around the vault. All other specifications of class AAA vault including providing tang bars conforming to IS 15369 (latest updated version) shall be followed.

7 WIRING ARRANGEMENT INSIDE VAULT

Electrical conduits shall be provided on the vault wall during the casting of vault wall itself to draw the power cable inside at later stage. The electric power inside the vault shall be interlocked with the vault main door in such a manner that when the vault door is closed the power supply inside the vault is cut-off. Spare limit switch may be provided for interlocking of power with vault door.

Provision shall be made to accommodate two separate power supplies, one for main lighting/fans and other for sensors, cameras, etc. All electrical wiring inside vault shall be as per the relevant Indian Standards. The power for lighting/fans inside vault shall be controlled by a power cut-off switch provided on vault door so that when the external vault door is closed, the power for lighting/fan inside vault shall get cut-off automatically. The other power supply for sensors and cameras inside vault shall continue even after the vault door is closed.

8 TANG BAR — DESIGN AND CONSTRUCTION DETAILS

8.1 Design

Tang bars shall be made from 230 mm wide and 3 mm nominal thickness sheet of steel with ultimate tensile strength more than 270 MPa (*see* IS 513 (part 1), IS 513 (part 2), IS 2062, IS 5986 and IS 1730) and shall be stamped in the form of a double comb for maximum material utilization (*see* Fig. 2). The tangs of the tang bar shall have tapered shape to resist the pulling attempt on tang bar from partially attacked concrete wall. The amount of taper to be included is 2.5 mm to 3.5 mm taper per tooth. Tang bars before laying down on the site shall be twisted by a tang bar twisting machine, to radiate the tangs in all directions. The number of twists of 180° each shall be approximately 2 per running meter length of tang bar. A typical form of twisted tang bar is given in Fig. 3.

8.2 Welded Tang Bar

8.2.1 When stamped from full sheet, the first and last strip of tang bars shall have tangs in one direction only. Two end strips of tang bars may be welded by manual metal arc welding or any other superior process like CO₂ welding, MIG welding, etc, with each other to have one full

tang bar having tangs in both directions. The percentage of welded tang bars to be used in a given wall shall be limited to a maximum of 7.5 percent subject to agreement by the purchaser.

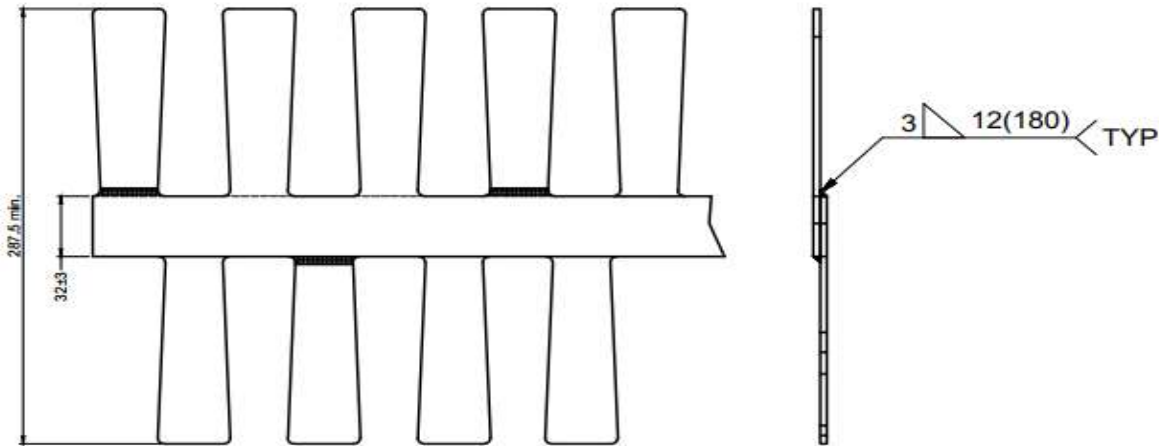


FIG. 3 TYPICAL TWISTED FORM OF TANG BAR

8.2.2 A typical welded flat tang bar construction is shown in Fig. 4.

8.3 Laying of Tang Bars

Tangs bars shall be laid in such a way that each tang bar shall overlap by minimum 25 mm along the length. When laid in double or triple rows the overlap should be minimum 25 mm across the row. Further the overlapping joints (along the length) shall be staggered in successive layer (like brickwork) to avoid weak section. While laying the tang bars, it is essential that the method adopted does not impair the efficiency of the structural reinforcement. The precise procedure may require variation to suit individual jobs and may call for the advice of the architect or structural engineer.



ALL DIMENSIONS ARE IN MILLIMETER
FIG. 4 TYPICAL WELDED TANG BAR

ANNEX A
(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

<i>IS No.</i>	<i>Title</i>
IS 456 : 2000	Plain and reinforced concrete - Code of practice (Fourth Revision)
IS 513 (Part 1) : 2016	Cold reduced carbon steel sheet and strip: Part1 cold forming and drawing purpose (sixth revision)
IS 513 (Part 2) : 2016	Cold reduced carbon steel sheet and strip: Part 2 high tensile and multi - Phase steel (Sixth Revision)
IS 1730 : 1989	Dimensions for steel plates, sheets strips and flats for general engineering purposes
IS 1732 : 1989	Steel bars round and square for structural and general engineering purposes
IS 2062 : 2011	Hot rolled medium and high tensile structural steel-Specification (Seventh Revision)
IS 2185 (Part 3) : 1984	Concrete masonry units : Part 3 Autoclaved cellular aerated concrete blocks
IS 5986 : 2017	Hot rolled steel sheet, plate and strip for forming and flanging purposes- Specification (Fourth Revision)
IS 9550 : 2001	Bright steel bars-Specification (First Revision)
IS 11188 (Part 1) : 2021	Vault (Strong room) doors : Part 1 Specification (Third Revision)
IS 11188 (Part 2) : 2021	Vault (strong room) doors : Part 2 Test for burglary resistance (Third Revision)
IS 14387 : 2021	Vaults —Air ventilators- specification (Second Revision)
IS 17541 : 2021	Modular panel for security of premises — Specification