Anhydrous Ammonia Bulk Storage:
Guidelines for British Columbia’s Industrial Railways

Guidelines Respecting the Design, Location, Construction, Operation and Maintenance of Stationary Bulk Storage Facilities for Anhydrous Ammonia

SHORT TITLE
1. These Guidelines may be cited as the *Anhydrous Ammonia Bulk Storage Guidelines*.

INTERPRETATION
2. In these Guidelines,
   “anhydrous ammonia” is dry ammonia gas in liquified form and is not to be confused with aqua ammonia which is a solution of ammonia gas in water;

   “BCSA” means British Columbia Safety Authority;

   “design pressure” is synonymous with “maximum allowable working pressure” as used in the A.S.M.E. Boiler and Pressure Vessel Code;

   “filling density” is the percentage figure obtained when the maximum weight of anhydrous ammonia that may be in a container is divided by the water weight capacity of the tank and the result is multiplied by 100; all capacities shall be measured at a liquid temperature of 60°F;

   “main track” means a track extending through yards and between stations upon which trains are operated by timetable or train order, or both, or the use of which is governed by block signals or other method of control;

   “MOTI” means the provincial Ministry of Transportation and Infrastructure;

   “owning or operating company” means the person or company owning or operating the installation erected with leave of the MOTI granted upon application made therefor by the railway company concerned on behalf of such person or company;

   “private track” means a track outside of a carrier’s right-of-way, yard and terminals, and of which the carrier does not own either the rails, ties, roadbed or right-of-way, or a track or portion of a track which is devoted to the purpose of its user, either by lease or written agreement, in which case the lease or written agreement will be considered as equivalent to ownership;

   “shall” is used to indicate mandatory provisions;

   “should” is used to indicate recommendatory;

   “team track” means a track on railway property which is used for loading or unloading purposes by more than one company or person.
APPLICATION

3. These Guidelines apply to stationary bulk storage facilities for anhydrous ammonia on the right-of-way owned or leased by any railway company subject to the jurisdiction of the MOTI.

4. (1) These Guidelines apply to new installations and additions or changes to existing installations, as of February 1, 1965.
   (2) Notwithstanding subsection (1), installations in operation before February 1, 1965 shall be operated in accordance with these Guidelines and, if ordered by the MOTI, shall also be made to conform to those parts of these Guidelines pertaining to location, construction and design.

PART I

STORAGE INSTALLATIONS

Application of Part

5. This Part does not apply with respect to installations with a total storage capacity not exceeding 2,000 Imperial gallons of water measured at 60°F, if such installations otherwise comply with all other applicable requirements of these Guidelines.

Application for Leave

6. No person shall begin the construction of storage facilities for anhydrous ammonia without leave of the MOTI granted upon an application made therefor through the railway company concerned.

7. The application shall be submitted to the MOTI together with four copies of all drawings, including plans and profiles, which shall comply with the requirements of sections 8 to 13.

8. The plan shall be drawn to a scale of not less than 50 feet to one inch and the profile to a scale of not less than 20 feet to one inch.

9. All drawings shall be dated and bear an identification number and the name of the applicant.

10. The plans shall show the distances between
    (a) the loading or unloading rack or point and
        (i) the gauge side of the nearest rail of the loading or unloading track,
        (ii) schools, stations, residential areas, hospitals and other similar places of public assembly within 200 feet of the said loading or unloading rack or point, and
        (iii) all engine houses, railway shops, grain elevators and other similar buildings within 125 feet of the said loading or unloading rack or point;
    (b) the centre line of the loading or unloading track and
        (i) the gauge side of the nearest rail of main track, and
        (ii) the gauge side of the nearest rail of the nearest adjacent track not serving the installation;
    (c) the storage tanks and
        (i) other storage tanks, pumphouses, warehouses, loading and unloading racks, and other structures on the site,
(ii) the line of adjoining property,
(iii) the gauge side of the nearest rail of the closest track,
(iv) the gauge side of the nearest rail of the main track,
(v) stations, schools, residential areas, hospitals or other similar places of public assembly within 350 feet of the said storage tanks, and
(vi) all engine houses, railway shops, grain elevators or other similar buildings within 200 feet of the said storage tanks.

11. (1) The profile shall show the elevation of the installation in relation to the loading and unloading track and any main track within 200 feet of the nearest tank on the said installation.

(2) A second profile is required where it is necessary
(a) to show the direction of drainage from the site; or
(b) to give a clear picture of major features of the installation.

12. The drawing shall show the location of the railway right-of-way, property fences, dikes, pipelines under roadways or railways, sewers, ditches, watercourses, highways and other similar structures that are on the installation site.

13. The notes or legend on the drawing shall include the following information:
(a) evidence that the Provincial Fire Commissioner or other authority having jurisdiction in the surrounding area has no objection to the proposed installation; this evidence may take the form of a plan signature of the authority concerned, or by a letter addressed to the owning or operating company by such authority;
(b) a statement that the storage tank design shall be approved by the Pressure Vessel Branch of the BCSA concerned prior to fabrication of the tanks;
(c) size, contents, and water capacity in Imperial gallons of all storage tanks;
(d) type and construction of pumphouse, warehouse, compressor house, bottling house, and any other building on the site;
(e) type of motive power to be used for pumps or compressors; and
(f) whether the track or tracks serving the installation are team tracks or private tracks.

13.1 Where the MOTI has, pursuant to section 6, granted leave to construct a storage facility for anhydrous ammonia, a copy of each drawing referred to in section 7 shall be kept by the railway for the life of the facility and retained for a least two years thereafter.

PART II

DISTANCES

14. (1) In no case shall an anhydrous ammonia storage tank be located less than 20 feet from any track. This distance shall be measured from the gauge side of the nearest rail to the nearest point on the tank shell.

(2) The following minimum distance from the gauge side of the nearest rail of the main track to the nearest point on the tank shell shall be observed:
<table>
<thead>
<tr>
<th>Water Capacity (Imperial Gallons) at 60°F, Single Tank</th>
<th>Minimum Distance (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 2,000</td>
<td>20</td>
</tr>
<tr>
<td>2,001 to 10,000</td>
<td>50</td>
</tr>
<tr>
<td>10,001 to 25,000</td>
<td>75</td>
</tr>
</tbody>
</table>

(3) It is recommended that the distance of a storage tank from the right-of-way of a provincial highway be not less than one-half the distance prescribed in subsection (2).

15. (1) The distances prescribed in this section shall be measured from the nearest point on the tank shell to the nearest point of the building, property line, etc.
(2) A storage tank with a water capacity exceeding 2,000 Imperial gallons shall be not less than 50 feet from any location on another property which may be built upon or from a source of drinking water such as a reservoir, well or spring.
(3) For a tank with a water capacity of 2,000 Imperial gallons or less, the distance from any location on another property which may be built upon shall be not less than 25 feet.
(4) If the storage tank is part of a water treatment system, the distance from a source of drinking water is not prescribed.
(5) A storage tank with a water capacity exceeding 2,000 Imperial gallons shall be at least 300 feet from any station, office building or other similar place of public assembly on railway property.
(6) It is recommended that the distance of storage tanks with water capacities exceeding 2,000 Imperial gallons from schools, hospitals, theatres, residential areas or other similar places of public assembly be not less than 300 feet.
(7) Except as provided in subsection (10), the distance of a tank with a water capacity of 2,000 Imperial gallons or less from any of the buildings mentioned in subsections (5) and (6) shall not be less than 50 feet.
(8) Except as provided in subsection (10), a storage tank with a water capacity exceeding 2,000 Imperial gallons shall not be less than 150 feet from engine houses, railway shops, grain elevators or other similar buildings.
(9) For a tank with a water capacity of 2,000 Imperial gallons or less, the distance from any of the buildings mentioned under subsection (8) shall not be less than 25 feet.
(10) Except as provided in subsection (12), the distance of a storage tank with a water capacity exceeding 100 Imperial gallons from any building on the installation site which is used exclusively by the company owning or operating the installation shall not be less than 10 feet.
(11) A tank with a water capacity of 100 Imperial gallons or less shall not be less than five feet horizontally from a building opening located at the same level as the tank vent or within five feet above the vent.
(12) When the construction or occupancy of the buildings referred to in subsection (10) is of such a nature as to constitute a hazard to the storage area, the distance between a building and the closest tank with a water capacity exceeding 100 Imperial gallons shall not be less than 50 feet.
(13) The clear distance between two anhydrous ammonia storage tanks with an individual water capacity exceeding 2,000 Imperial gallons shall not be less than five feet.
(14) The clear distance between a tank containing anhydrous ammonia and a tank containing a flammable liquid shall not be less than 20 feet, except that installations with a storage
capacity exceeding 150,000 Imperial gallons of water measured at 60°F shall be located not less than 100 feet from the above ground storage of flammable liquids.

(15) An anhydrous ammonia storage tank shall not be located within a diked area containing a flammable liquid storage tank.

(16) The distance between any tank of one group and any tank of another group as defined in section 22 shall not be less than 25 feet.

16. (1) The distances prescribed in this section shall be measured from the gauge side of the nearest rail of the nearest adjacent track not serving the installation or the main track, as the case may be, to the centre line of the unloading or loading tracks.

(2) The unloading or loading tracks at the loading or unloading site shall be at least 50 feet from the main track.

(3) The unloading or loading tracks shall be at least 20 feet from the nearest adjacent track not serving the installation, and if the nearest adjacent track is a main track, the distance shall be 50 feet.

17. (1) That portion of loading or unloading racks or other structures over four feet high shall be at least six feet from the gauge side of the nearest rail of the loading or unloading track. That portion of the structure four feet or less in height shall be at least three feet 7 3/4 inches from the gauge side of the nearest rail of the loading or unloading track. When the track is curved, the clearance distance shall be increased one inch per degree of track curvature.

(2) Loading and unloading terminals or structures of an overall height that is less than four feet shall be located at least six feet from the gauge side of the nearest rail of the loading or unloading track.

18. (1) The distances prescribed in this section shall be measured from the loading or unloading point to the nearest point of the building or property line, as the case may be.

(2) The loading or unloading racks or points shall be at least 150 feet from any station, office building or other similar place of public assembly on railway property.

(3) It is recommended that the distance of loading or unloading racks from schools, hospitals, theatres, residential areas, or other similar places of public assembly be not less than 150 feet.

(4) Except as provided in subsection (5), the loading or unloading racks or points shall not be less than 75 feet from engine houses, rail shops, grain elevators, or other similar buildings.

(5) The distance of loading or unloading racks from a tank or building used exclusively by the owning or operating company shall not be less than 10 feet.

19. (1) Pumphouses or compressor houses and outdoor pumps or compressors driven by non-explosion proof motors or internal combustion engines shall be located not less than 10 feet from any storage tank, loading or unloading point, or building.

(2) The distance requirement of subsection (1) does not apply to outdoor pumps or compressors driven by explosion proof motors marked or labelled Class I, Division I, Group D and wired in accordance with the Canadian Electrical Code for Class I, Division I, Group D locations.

(3) The distance of pumphouses or compressor houses and outdoor pumps or compressors from any location on another property which may be built upon shall not be less than 25 feet.

20. The distance between a tank truck and a tank or tank car during loading or unloading operations shall not be less than 10 feet measured between the nearest points on the two tank shells.
PART III

STORAGE TANKS

21. A cylinder or tank with a water capacity not exceeding 100 Imperial gallons and manufactured, filled, operated and maintained in accordance with a Canadian Transport Commission or an Interstate Commerce Commission specification, which is approved by either of these authorities for anhydrous ammonia, is exempt from sections 22 to 28 and all sections of Part V.

22. (1) The water capacity (measured at 60°F) of any unrefrigerated anhydrous ammonia storage tank located on carrier’s right-of-way shall not exceed 25,000 Imperial gallons.
(2) The aggregate water capacity of tanks assembled in one group shall not exceed 150,000 Imperial gallons and groups of tanks shall be segregated as prescribed in subsection 15(16).

23. (1) Unrefrigerated tanks shall be constructed in accordance with the 1956, 1959 or 1962 issues of the A.S.M.E. Boiler and Pressure Vessel Code for Unfired Pressure Vessels to a design working pressure not less than 250 psig and a safety factor of not less than four.
(2) The tank design shall be approved by the Pressure Vessel Branch of the BCSA.
(3) Tank design drawings and specifications shall be in accordance with the requirements of Canadian Standards Association Pamphlet B-51 (1957).
(4) Refrigerated tanks shall be designed in accordance with the directions of subsection (1) to a minimum design working pressure of 60 psig.
(5) Containers exceeding 36 inches in diameter or 200 Imperial gallons water capacity shall be stress relieved after fabrication in accordance with the Code, or cold-formed heads, when used, shall be stress relieved, or hot-formed heads shall be used.
(6) Welding to any parts of a tank subject to internal pressure shall be in accordance with the Code under which the tank was fabricated; non-Code welding is permitted only on saddle plates, lugs or brackets attached to the container by the tank manufacturer.

24. (1) All tanks shall be inspected and tested prior to being put into use at the pressure specified by the A.S.M.E. Code by a Safety Officer from the Boiler and Pressure Vessel Branch of BCSA.
(2) A copy of the tank test and inspection report shall be filed with the Boiler and Pressure Vessel Branch of BCSA.

25. The tank shall be permanently marked or labelled as required by the A.S.M.E. Code under which the tank was manufactured and the Boiler and Pressure Vessel Branch of BCSA.

26. Each above-ground tank with a water capacity exceeding 1,000 Imperial gallons shall be electrically grounded for protection against lightning with the resistance to ground being as low as possible and preferably not in excess of six ohms.

27. Each tank with a water capacity exceeding 2,000 Imperial gallons shall be equipped with a suitable pressure gauge graduated from 0 to 400 psi.

28. Each tank with a water capacity exceeding 5,000 Imperial gallons should be equipped with a suitable thermometer unless some other provision is made for determining the liquid temperature.

29. The below-ground installation of anhydrous ammonia tanks on the carrier’s right-of-way is prohibited.
30. (1) Except as provided in subsection (7), storage tanks shall be securely installed on solid foundations of steel or reinforced concrete with reinforced concrete footings extending below the frost line or resting on bedrock.

(2) Except as provided in subsection (6), steel foundations shall be fire-proofed with a material having a fire resistance rating of not less than two hours.

(3) Foundations shall be of sufficient width and thickness to adequately support the tank and its contents.

(4) Provision shall be made for the thermal expansion and contraction of a tank.

(5) Only two saddles shall be used for horizontal tanks.

(6) Steel saddles which are welded to a tank need not be fire-proofed if the tank capacity does not exceed 500 Imperial gallons, or if the over-all height of the saddle does not exceed 18 inches.

(7) Footings for tanks with a water capacity less than 500 Imperial gallons need not be installed below frost line if adequate provision is made to protect the piping against the effects of settling.

31. (1) Storage tanks shall not be installed in a building, unless the building is to be used exclusively for the storage of anhydrous ammonia and is ventilated to prevent the accumulation of fumes.

(2) Storage tanks shall not be installed in outdoor locations where the natural dispersal of fumes would be seriously restricted.

32. (1) The filling density of above-ground unrefrigerated tanks shall not exceed 56 per cent for uninsulated tanks and 57 per cent for insulated tanks; for volume filling at various liquid temperatures, refer to chart of figure 23, Pamphlet G-2 of Compressed Gas Association, Inc.

(2) The maximum amount of anhydrous ammonia that may be charged into a refrigerated storage container shall be that which theoretically would make the container liquid-full at a pressure equal to 120 per cent of the design pressure of the container under equilibrium conditions of temperature and pressure.

33. (1) Unless filling is controlled by weighing, tanks shall be equipped with a fixed tube liquid level, a rotary tube, an adjustable slip tube gauge, or other gauging device that will ensure that the maximum permitted filling density is not exceeded. If the gauging device is a float type or pressure differential type, the tank shall also be provided with a fixed tube, rotary tube, or adjustable slip tube gauge.

(2) Gauge glasses of the columnar type shall be equipped with shut-off valves having metallic hand wheels, excess flow valves, extra heavy glass adequately protected by a metal housing applied by the manufacturer and shall be protected from the direct rays of the sun.

PART IV

PIPING AND TRANSFER EQUIPMENT

34. Pumps and compressors used for transferring anhydrous ammonia shall be of a type suitable for anhydrous ammonia service, shall be designed for not less than 250 psig working pressure, and shall be so recommended and permanently marked or labelled by the manufacturer.

35. Piping at pumps and compressors shall be so arranged as to ensure the safe operation of this equipment.
36. Refrigeration load and equipment for refrigerated storage systems shall be in accordance with the current edition of Agricultural Ammonia Institute pamphlet, Standards for the Storage and Handling of Anhydrous Ammonia.

37. (1) Hose and hose connections subject to container pressure shall be designed for a working pressure of not less than 350 psig with a factor of safety of not less than five.
(2) The hose, as assembled for use, shall be tested for leaks at not less than twice the maximum working pressure before being put into service and should be tested at least annually thereafter at not less than 1 1/2 times the maximum working pressure.
(3) The hose shall be permanently and clearly marked or labelled “For Anhydrous Ammonia” or “NH3”, or “A.A.”, together with the maximum working pressure, manufacturer’s name or symbol and year of manufacture.
(4) Hose couplings shall be of steel.
(5) Hose materials shall be resistant to the action of anhydrous ammonia under the service conditions to which they will be subjected.
(6) Hose and hose connections located on the low pressure side of flow control or pressure reducing valves or devices, discharging to atmospheric pressure, shall be designed for a minimum working pressure of 60 psig.
(7) Where hose is to be used for transferring liquid, wet hose is recommended and the hose shall be equipped with a shut-off valve on the discharge end and provision shall be made to prevent excessive hydrostatic pressure on the hose.
(8) The use of hose is prohibited for interconnecting stationary containers.

38. (1) Piping shall be schedule 40 mild steel with welded joints and welding type fittings, or schedule 80 mild steel with either screw type or welded joints and welding type fittings.
(2) Brazed joints are prohibited.
(3) Unless the dryness of the ammonia can be assured, copper; copper, silver or zinc alloys, including brass or bronze; or galvanized pipe, valves or fittings shall not be used.
(4) The use of cast iron pipe, valves or fittings in anhydrous ammonia service is prohibited.
(5) Anhydrous ammonia shall not be allowed to come in contact with mercury in manometers and other equipment.
(6) Joint compounds and pipe dopes shall be suitable for ammonia service.
(7) Welding shall only be done by a qualified welder recognized as such by the Boiler and Pressure Vessel Inspection Branch of the BCSA.

39. All storage tank connections, except those for safety relief valves or gauges, shall be labelled to indicate whether they communicate with the vapour or liquid phase during normal operations.

40. All storage tank connections, except those for gauges, safety relief valves or plugged openings, shall be provided with shut-off valves located as close to the tank as possible.

41. (1) All shut-off valves, throttling valves, gauges, and accessory equipment shall be of a type suitable for anhydrous ammonia service and shall be designed for not less than the maximum working pressure to which they may be subjected, except that the rated working pressure of valves, etc., subject to container pressure shall not be less than 250 psig.
(2) All valves, gauges, fittings, and accessory equipment mentioned in subsection (1) shall be permanently marked or labelled with their maximum working pressure and the letters “A.A.” or “NH3” to indicate their suitability for anhydrous ammonia service; e.g., “250 — A.A.”.
42.  (1)  Except as provided in subsection (4), all openings in unrefrigerated containers, except those for safety relief valves and those connections protected by an opening not larger than a No. 54 drill size (0.0550 inch), shall be equipped with excess flow valves or other suitable automatic valve or device which will automatically prevent loss of the tank contents in the event of a connection or line failure.

(2)  Connections on refrigerated containers shall be protected with excess flow valves or other devices as prescribed in the current edition of Agricultural Ammonia Institute pamphlet, Standards for the Storage and Handling of Anhydrous Ammonia.

(3)  Excess flow valves shall be designed with a bypass not to exceed a No. 60 drill size (0.0400 inch) opening to allow equalization of pressures.

(4)  An excess flow valve or other automatic device as prescribed in subsection (1) is not required for withdrawal connections of unrefrigerated tanks with a water capacity not exceeding 1,500 Imperial gallons, if the connection is protected by a controlling orifice not exceeding 5/16 inch diameter for vapour withdrawal and 1/8 inch diameter for liquid withdrawal, a manually operated shut-off valve, and a pressure-reducing regulator, all of which shall be assembled to the connection as prescribed in 2.2(d), Division II of the 1958 edition of National Fire Protection Association pamphlet No. 58.

(5)  Excess flow valves shall be permanently marked or labelled by the manufacturer with their maximum working pressure, rated capacity and the letters “A.A.” or “NH3” to indicate their suitability for use in anhydrous ammonia service.

(6)  Excess flow valves or other automatic devices, as referred to in subsection (1), shall be installed in such a manner that rupture of the line or connection will not adversely affect the protective device.

(7)  The connection or line housing an excess flow valve shall have a greater capacity than the rated capacity of the excess flow valve.

43.  Portable engines, motors, pumps and compressors are not recommended, but if used, shall be securely mounted on a rigid base and every precaution taken to ensure that the installation is stable and well protected against possible physical damage.

44.  Unless the installation is enclosed by a wire mesh fence not less than five feet in height and provided with a locked gate, tank shut-off valves shall be shut tight and locked during the absence of the attendant.

45.  (1)  Piping shall be carried on permanent steel or concrete supports, and supports for pipelines more than four feet above ground shall rest on footings extending below frost line.

(2)  Provision shall be made in the piping for expansion, contraction and settling.

(3)  Pipeline shall be protected by metal guard rails against damage from trucks and other traffic.

46.  (1)  Except as provided in subsections (2) and (3), below-ground ammonia lines shall be laid not less than three feet below ground or be enclosed in a reinforced concrete or steel trench with a recessed removable cover which shall be flush with the ground. The trench shall be of sufficient strength to support all traffic which may pass over it and shall be provided with drainage.

(2)  Pipelines under roadways on railway property shall be enclosed in an encasing pipe of sufficient strength to support all traffic which may pass over it and shall be not less than three feet below the surface of the roadway.
Pipelines under railways shall be installed in accordance with *Pipe Crossings Under Railways Guidelines for Industrial Railways*.

47. (1) Except for pipelines between adjacent loading or unloading racks, pipelines on the railway right-of-way within 20 feet of the gauge side of the nearest rail of a track shall be laid not less than three feet below ground, or be enclosed in a reinforced concrete or steel trench as prescribed in subsection 46(1), or be carried on an overhead pipe bridge with a clearance above ground of not less than 13 feet, or be enclosed by a fence.

(2) Pipelines running parallel to a track, except those between adjacent unloading or loading racks, shall not be closer than 10 feet to the gauge side of the nearest rail of that track and shall comply with subsection (1).

48. Provision shall be made in loading or unloading lines for relief of pressure before disconnection.

49. When loading or unloading racks are not employed for loading or unloading tank cars, the filling or discharge terminals shall be protected on all sides by a guard rail of metal or other material of equivalent strength and permanence. The guard rail shall be not less than three feet in height.

50. Tank car loading or unloading lines shall be equipped with shut-off valves located at the tank car end of the loading or unloading line. These valves shall not be used for throttling purposes, but shall be either fully open or fully closed in order not to interfere with the operation of excess flow valves on the tank car.

51. All piping inside buildings where anhydrous ammonia is stored or handled shall be grounded to prevent the build-up of static electricity. The resistance to ground shall be as low as possible and preferably not more than six ohms.

52. (1) All piping, valves and fittings shall be inspected and tested after assembly and prior to commencing operations for the first time and be proven gastight at a pressure not less than the working pressure of the tank, pump or device to which they are connected, or at 150 psig if this is a higher pressure.

(2) The results of the piping inspection and test shall be reported to the BCSA.

53. (1) If housed, pumps or compressors driven by internal combustion engines or non-explosion proof motors shall comply with subsections (3) to (6).

(2) The pump or compressor should be separated from the engine or motor by a fireproof and vapour-proof wall.

(3) Except for the frame, the building shall be constructed of noncombustible or fire-resistant materials.

(4) Engine exhausts shall terminate outside the building.

(5) The building shall be cross-ventilated near the ceiling level.

(6) The entire system shall be maintained in good operating condition at all times.

**PART V**

**SAFETY RELIEF DEVICES**

54. (1) Each unrefrigerated tank shall be equipped with one or more safety relief valves of the spring loaded type or an equivalent type which have been approved for the intended service by the
Boiler and Pressure Vessel Committee of A.S.M.E., or the Compressed Gas Association, Inc., or Underwriters' Laboratories.

(2) The valves referred to in subsection (1) shall be of a size that will ensure a rate of discharge not less than that specified in the current edition of Agricultural Ammonia Institute pamphlet, Standards for the Storage and Handling of Anhydrous Ammonia.

(3) The rate of discharge prescribed in subsection (2) shall be obtained before the pressure is in excess of 120 per cent of the maximum permitted start to discharge pressure setting of the device.

(4) The rate of discharge for relief valves on refrigerated tanks shall be in accordance with the current edition of Agricultural Ammonia Institute pamphlet, Standards for the Storage and Handling of Anhydrous Ammonia.

(5) Safety relief valves on unrefrigerated tanks shall be set to start to discharge at pressures as prescribed in the current edition of Agricultural Ammonia Institute pamphlet, Standards for the Storage and Handling of Anhydrous Ammonia.

(6) Relief valves on refrigerated containers shall be set to discharge at a pressure not in excess of the design working pressure of the container.

(7) Safety relief valves shall be installed in a manner that will ensure that the full relief requirements are always satisfied.

55. (1) All storage tank relief devices shall be located on the storage tank and shall have direct communication with the vapour space of the tank.

(2) If the design of the relief system is such that liquid can collect on the discharge side of the disc, the valve shall be equipped with a suitable drain.

(3) Tank safety relief valves shall be vented vertically to the outside atmosphere at a safe location and at least seven feet above the tank; except that for a tank of 2,000 Imperial gallons capacity or less and not provided with a ladder or other means of access to the top, the top of the vent shall not be less than seven feet above ground level.

(4) The end of the vent pipe shall be fitted with a loose rain cap that will not freeze in place.

(5) Safety relief devices shall be so arranged that the possibility of tampering will be minimized.

(6) Return bends and restrictive piping are not permitted in relief valve piping.

(7) External pressure settings or adjustments shall be sealed.

56. Safety relief valves and devices shall be inspected and tested prior to being put into service and shall be retested periodically as prescribed in the Compressed Gas Association pamphlet, Safety Relief Device Standards for Compressed Gas Storage Containers.

57. (1) A safety relief valve venting to the outside atmosphere at a height not less than seven feet above ground level shall be installed between each pair of shut-off valves in an ammonia line where liquid may be trapped. The start to discharge pressure shall not be less than the setting of the container relief valve and not in excess of 400 psig.

(2) Sections of pipelines between shut-off valves and compressors, or shut-off valves and positive displacement pumps, shall be equipped with safety relief valves or bypasses set to discharge at a pressure not less than 240 psig and not over 400 psig.

58. Each safety relief device shall be permanently marked or labelled by the manufacturer with the following information:

(a) start to discharge pressure in psig;

(b) full-open rate of discharge in c.f.m. of air at 60°F and 14.7 psia;

(c) letters “NH3” or “A.A.” to indicate its suitability for use in anhydrous ammonia service;

(d) manufacturer’s name or symbol;
(e) year of manufacture; and
(f) A.S.M.E. or Compressed Gas Association, or Underwriters’ Laboratories symbol.

PART VI

LOADING AND UNLOADING

59. (1) The tank car, during loading or unloading operations, shall be protected on the connected end or ends of the siding by a sign of metal or other suitable material 12 inches by 15 inches in size and reading “STOP — TANK CAR CONNECTED”. The word “STOP” shall be in letters at least four inches high and the other words in letters at least two inches high and the letters shall be white on a blue background.

(2) The “STOP” sign shall be placed on the tank car or on the loading or unloading track in a manner that will ensure it is always visible to the crew of an engine on the same track.

60. (1) At least one experienced operator supplied by the consignor or the consignee, as the case may be, shall supervise the loading or unloading operations, and during the absence of this operator from the installation site, loading or unloading shall be discontinued.

(2) During loading or unloading operations, tank car hand brakes shall be kept applied and the wheels at both ends of the tank car shall be blocked.

(3) Tank cars shall be disconnected from pipelines immediately after the completion of loading or unloading operations.

(4) Loading or unloading operations shall be carried out only during the hours of daylight unless fixed permanent electric lighting is provided in accordance with section 66.

61. Except as provided in the schedule, the direct transfer of anhydrous ammonia between tank cars and tank trucks or drums on carrier’s right-of-way is prohibited.

62. The loading or unloading of tank cars located on a carrier’s track are subject to the following conditions:

(a) except as provided in paragraph (d), tank car liquid discharge connections shall be equipped with excess flow valves;

(b) except as provided in section 61, lading shall be piped directly to permanent storage tanks of sufficient capacity to receive the entire contents of the tank car. The tanks and all of the facilities associated with them shall be in accordance with all applicable provisions of these Guidelines;

(c) when the carrier’s track is a team track, it is recommended that where practicable, the tank car be protected during loading or unloading by a locked derail located at least one car length from the tank car on the connected end or ends of the team track; and

(d) tank cars of the I.C.C. 106A type may be loaded or unloaded on carrier’s track if written permission is obtained from the carrier concerned, and equipment is provided for the safe unloading or loading of the unit tanks, but such tanks shall not be stored on carrier’s property except as provided in these Guidelines.

63. Loading or unloading tracks which cross street railway tracks or show evidence of stray electric currents shall be insulated from the rest of the track at the loading or unloading site in accordance with the Electric Sparks Prevention Guidelines for Industrial Railways. Loading or unloading tracks equipped for electrical operation shall comply with those Guidelines.
PART VII

GENERAL
64. The area within 25 feet of a storage tank exceeding 200 Imperial gallons, a loading or unloading rack, pump, building, etc. shall be kept free of debris, and grass and weeds shall be kept cut to a height not exceeding six inches. The general housekeeping and maintenance of buildings, tanks, etc. shall be of the highest standard.

65. Defective piping, valves, or fittings shall be repaired immediately.

66. (1) All electrical equipment, fixtures, switches, and wiring inside buildings where anhydrous ammonia is stored or handled shall conform to the requirements of the latest edition of the Canadian Electrical Code for Class I, Division II hazardous locations and any local or provincial requirements of a higher standard.

(2) Electrical installations in other locations within 25 feet of any anhydrous ammonia storage tank, equipment, or loading or unloading point shall conform to the requirements of the latest edition of the Canadian Electrical Code for corrosive atmospheres (Category 2).

67. (1) All uninsulated storage containers with a water capacity exceeding 100 Imperial gallons which are installed out-of-doors shall be painted with a white heat reflective coating, preferably an enamel or self-cleaning paint.

(2) The words “CAUTION — AMMONIA” in letters not less than six inches high shall be painted on each outdoor tank with a water capacity exceeding 2,000 Imperial gallons.

68. (1) Except for the frame, pumphouses, compressor houses, or buildings in which anhydrous ammonia is handled shall be constructed of noncombustible or fire-resistant materials.

(2) All enclosures where anhydrous ammonia is handled shall be cross-ventilated with permanently open louvers at the ceiling level.

(3) Containers of flammable liquids or gases shall not be stored in a room occupied by anhydrous ammonia equipment.

(4) Buildings shall be maintained in a clean and tidy condition.

69. Smoking and the use of portable open flame lights or equipment shall be prohibited except in certain isolated and clearly-designated areas. Signs to this effect shall be posted at the plant entrances and at the loading and unloading sites. (See section 72 for restrictions applying to welding.)

70. All anhydrous ammonia installations are subject to inspection at any time by any Railway Safety Inspector of the BCSA.

71. The owning or operating company shall immediately report to the railway company and the Railway Safety Manager of BCSA in New Westminster, every fire resulting in damage to the installation, explosion, or major pipeline or tank failure occurring on the installation, and shall submit a detailed written report within 30 days of the accident occurring.
72. Welding shall not be permitted within 100 feet of a loading or unloading site while loading or unloading operations are in progress. At other times, welding shall only be allowed when carried out under close supervision and in accordance with the provisions of Canadian Standards Association pamphlet W-117.

73. (1) Each storage area with a water capacity exceeding 2,000 Imperial gallons should be protected by at least one standard fire hydrant so located that a 2 1/2-inch hose stream may be used for controlling a fire on the site or for cooling a tank in case of adjacent fires. Consultation with the local fire authority is recommended.

(2) Fire extinguishers suitable for small fires shall be available on installations with a storage capacity exceeding 2,000 Imperial gallons. At least one fire extinguisher shall be kept on the outside premises.

74. The principal hazards associated with the handling of anhydrous ammonia are as follows:
(a) mixtures of air and anhydrous ammonia consisting of 16 to 25 per cent by volume of anhydrous ammonia are flammable and may ignite at a temperature as low as 1204°F in the presence of iron. For outdoor installations, this condition is not likely to be obtained except as a result of a tank or pipeline rupture. However, serious fires and explosions have occurred in which anhydrous ammonia was a contributing factor. Anhydrous ammonia becomes slightly unstable at 840-930°F and dissociates into hydrogen and nitrogen. The presence of small quantities of oil or other combustible material in anhydrous ammonia will increase the fire hazard;

(b) 100 p.p.m. is the maximum average atmospheric concentration of ammonia to which workers may be repeatedly exposed without adverse effect on their health. Exposure to concentrations of 250 p.p.m. for 30 minutes is considered dangerous and an exposure of 30 minutes’ duration to concentrations of 5,000 p.p.m. is considered to be fatal. Industrial gas masks of a type approved for use in ammonia atmospheres should be located in a convenient place. Approximately 400 p.p.m. will cause immediate throat irritation and 700 p.p.m. will cause immediate eye irritation; and

(c) in addition to the above-mentioned hazards, anhydrous ammonia is shipped and stored under pressure and those general safety precautions prescribed for the handling of compressed gases should be observed.

75. Safety equipment, as prescribed in the current edition of Agricultural Ammonia Institute pamphlet, Standards for the Storage and Handling of Anhydrous Ammonia should be provided at all bulk storage installations.

76. For further details, the following publications are suggested:
(a) Standards for the Storage and Handling of Anhydrous Ammonia, by the Agricultural Ammonia Institute of Memphis, Tennessee;
(b) Anhydrous Ammonia Pamphlet G-2, by the Compressed Gas Association, Inc., 500 Fifth Ave., New York 36, New York;
(c) Chemical Safety Data Sheet SD-8, by the Manufacturing Chemists’ Association, Inc., 1625 Eye Street N.W., Washington 6, D.C.;
(d) Compressed Gas Association pamphlet Safety Relief Device Standards for Compressed Gas Storage Containers, published by the Compressed Gas Association, Inc., 500 Fifth Ave., New York 36, New York; and
(e) Liquefied Petroleum Gas pamphlets No. 58 and No. 59 by the National Fire Protection Association, 60 Batterymarch Street, Boston 10, Massachusetts.
SCHEDULE

TEMPORARY TRANSFER FACILITIES

1. The transfer of anhydrous ammonia between a tank car located on the right-of-way of a railway subject to the jurisdiction of the MOTI and any vessel other than a permanently-installed storage tank of sufficient capacity to receive the entire contents of the tank car is prohibited by sections 73.432 and 74.560 of the Regulations for the Transportation of Dangerous Commodities by Rail and section 61 of these Guidelines. However, it is recognized that under certain circumstances temporary relief from compliance with these requirements is in the public interest and may be granted without jeopardizing the safety standards.

2. (1) The prerequisites for obtaining permission to transfer anhydrous ammonia between a tank car and a vessel other than a permanently-installed storage tank are as follows:

(a) except as provided in subparagraphs (i) to (iii), the direct transfer of anhydrous ammonia between a tank car and a vessel other than a permanently-installed storage tank shall comply in all respects with the requirements of these Guidelines,

(i) the requirements of Part III of these Guidelines pertaining to storage tanks are waived,

(ii) notwithstanding the distance requirements of Part II of these Guidelines, the distance between the transfer connection of a tank car and a building or place shall not be less than the following:

(A) a building or a place of public assembly or a residence, 300 feet,
(B) a storage warehouse, a grain elevator, or any building other than those mentioned in clause (A), 150 feet,

(iii) notwithstanding the application requirements of Part I of these Guidelines, drawings need not accompany applications requesting approval for periods that do not exceed six months if in addition to providing the information requested in paragraphs (b) and (c), the following information is also provided:

(A) the location of the proposed transfer operation with respect to railway, town, mileage and subdivision,

(B) evidence that the fire prevention authority with jurisdiction in the surrounding area has no objection to the proposal,

(C) the application shall bear a signed and dated statement reading as follows:

“This proposal complies in all respects with the conditions of approval prescribed in the Schedule to the Anhydrous Ammonia Bulk Storage Guidelines”;

(b) the applicant shall satisfy the MOTI that it is not practical or reasonable to erect permanent transfer facilities and storage tanks under the prevailing circumstances, and that granting relief from compliance with the requirements of the Regulations for the Transportation of Dangerous Commodities by Rail will not create a condition of unfair competition during the period of approval with respect to the permanent storage facilities approved by the MOTI which are located in the same general area; and

(c) cargo tanks, drums or other vessels which are used in the direct transfer of anhydrous ammonia to or from a tank car shall meet all provincial and local requirements with respect to their registration, design, construction, operation, etc.