

## CSA Standard S350-1980 Safety in Demolition of Structures

### Scope and Application:

This standard outlines the safety precautions to be considered and procedures to be used before, during and after demolition operations, to provide for the safety of public, workers and property.

The standard describes demolition procedures for:

- Systemic demolition method, and
- Rapid progressive failure method.

The appendix recommends demolition techniques for specific types of structures, including prestress concrete and post-tensioned concrete, other structures (rigid frames and arches, pitched trusses, cantilevers, bridges, chimney, and below grade structures, etc). This standard shall be read together with part 8 of the National Building Code.

### Definitions:

- Hand demolition – a systemic demolition of structures by workers using hand held tools.
- Mechanical demolition – the systemic demolition of structures using powered equipment.
- Systemic Demolition -- a methodical dismantling of structures piece by piece. It is usually carried out in the reverse order of construction.

### Preliminary survey to be conducted before demolition operation begins it to include:

- examination of the site, (and where necessary an engineer survey of the structure in order to determine the type of the structure), its condition, and the site condition;
- efforts to obtain the original drawings;
- potential effects of removal of any part(s) of the remaining structure;
- walls shall be examined to determine if they are load-bearing walls or they act as ties or braces for other parts of the structure; pre-stressed elements;
- examination to determine if any part of the structure is suspended from another;
- examination to determine if there is any cantilever part of the structure;
- the effects of soil, water and any other pressure on retaining or foundation walls;
- basements, vaults, or similar underground construction shall be examined if they extend beyond the confines of the structure; or if there are any tanks, wells, containers, drums of flammable materials, corrosive chemicals, or gas cylinders;
- damage or deterioration of the structure shall be determined before the demolition begins;
- effects of demolition on adjacent structures; consideration shall be given to underpinning, shoring, bracing, protection from noise, dust, weather, vibration, and impact;
- identify the location of underground facilities: electrical power lines, gas lines, oil pipes, phone, water mains, drainage pipes, stem pipes, communications cables; and notification shall be given to authorities having jurisdiction;

From the above survey, demolition techniques and sequence shall be established and the Statutory notices and Permits obtained.

### Precautions during demolitions (detailed in the standard, refer to):

- public protection, including vehicular and pedestrian protection;
- enclosure and site security;

- sidewalk sheds: height not less than 2.25 m, width not less than 1.25 m and capable of withstanding 4.8 kN/m square. More details are found in the standard on the construction and materials to be used;
- catch platforms – used for demolition of structures more than 15 m height (details are provided in the standard);
- warning devices and signs;
- adjacent properties and services protection (detailed in the standards and includes regular inspection);
- structure to be demolished that shall not pose a risk to workers during operation, (access and egress provisions are described);
- climate conditions that may cause risks (e.g. snow loading and drifting);
- fire protection shall be considered as per provincial regulation and Part 8 of the National Building Code;
- chute provisions: angle shall be greater than 45 degrees, the opening shall not exceed more than 1.25 m measured along the wall of the chute, and shall be kept closed when not in use;
- floor openings shall be less than 25% of the floor area (details are given on the enclosures);
- burning materials requirements;
- pollution control requirements.

Precautions after demolition are briefly discussed in the standard and refer to safe condition of the site after demolition operations have been completed.

### **Demolition Technology:**

Systemic Demolition this technique is generally performed when structures are demolished in reverse order of construction. The sequence of demolition shall not allow a wall or portion of a wall to be left standing unsupported in an unstable condition or in danger. Types detailed in the standard are:

Hand Demolition: where hand held tools are used in demolition, the manufacturer recommendations shall be followed in the use of such tools. Special safety attention shall be given when thermic lance or hydraulic splitters are employed

Mechanical Demolition: general guidance is provided in the standard for the use of powered equipment, including:

- when equipment is used on a structural floor, the allowable capacity is not exceeded by the equipment and the accumulated debris;
- adequate ventilation
- demolition by pushing – the application of the force shall be no less than 2/3 the height of the element measured from the base of the element,
- demolition by pulling – the horizontal distance from the cab of the equipment to the face of the element shall be greater than the vertical distance from the grade of the machine to the top of the element. The rope or chain used shall have a breaking strength of at least four times the theoretical computer force required to perform the demolition and shall be inspected at least twice daily. No person shall be positioned between the equipment and the structure, and no person shall be permitted on either side of the rope or chain to a distance equal to at least the distance between the equipment and the structure.
- demolition by balling – general guidance is provided in the standard and refers to:
  - balling shall begin from the top down, in each section of the structure;
  - if ball becomes entangled with the debris, it should be left to drop with the debris;
  - the crane operator shall ensure there is sufficient cable on the drum and shall allow the ball to descend to the lowest point to which the debris can fall, plus 10% of the total length of the cable, but in no case less than 3 wraps;
  - the boom and the cable of the equipment used shall have a rated capacity at the working radius of at least 5 times the weight of the ball being used;
  - the boom shall be as short as possible; boom connecting pins shall be inspected twice daily; the ball shall be attached to the hoist line by a swivel connected to several loops of cables through the eye of the ball;
  - the load line shall be inspected at least twice daily;

- The standard includes brief guidance on swing balling, drop balling, and stationary boom balling.

**Rapid Progressive Failure Method:**

- the collapse of the structure shall be ensured, in order to eliminate the possibility of any unstable portion of the structure;
- there shall be sufficient clear space around the structure to accommodate the fall of the structure;
- demolition by explosives – consideration shall be given to:
  - storage, handling and transport of explosives as per the Canada Explosives Act,
  - use of explosives as per Provincial regulations;
  - assessment of the structure in order to determine the feasibility of using explosives in demolition, including: clearance, potential danger to life, disruption of traffic, soil conditions, presence of hazardous material;
  - general guidance is provided in the standard for safe demolition when using explosives.

**This bulletin contains a summary of excerpts taken from the Standard, for general information purposes only. This bulletin is not reflective of the complete requirements that the Standard prescribes.**

**Note:** *Manitoba Regulation M.R. 217/2006 Section 1.4 inconsistency:*

If there is an inconsistency between this regulation and a requirement contained in a publication, code or standard referenced in this regulation, the provisions in this regulation prevail.