

## **USE OF EXPLOSIVES**

### **Amendments to OPSS 120**

OPSS 120 is deleted in its entirety and replace with the following:

#### **120.01 SCOPE**

This specification covers the requirements for the use of explosives on the Contract.

##### **120.01.01 Specification Significance and Use**

Use of this specification or any other specification shall be according to the Contract Documents.

#### **120.02 REFERENCES**

This specification refers to the following standards, specifications, or publications:

##### **Ontario Ministry of Transportation Publications**

Ontario Traffic Manual  
(OTM): Book 7 -Temporary  
Conditions

##### **Department of Fisheries and Oceans (DFO) Publication**

Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters, 1998

##### **International Society of Explosives Engineers (ISEE)**

Performance Specifications for Blasting Seismographs, 2011 Edition

#### **120.03 DEFINITIONS**

For the purpose of this specification, the following definitions apply:

**Blaster** means a competent person knowledgeable, experienced, and trained in the handling, use, and storage of explosives and their effect on adjacent property and persons.

**Blast Monitoring Consultant** means a consulting engineering firm with a minimum of 5 years experience related to blasting hired to provide blast monitoring services. The Blast Monitoring Consultant shall be retained by the Contractor and shall be a third party that is not owned or corporately affiliated with the Contractor or any subcontractor responsible for the the blasting work. The Blasting Consultant shall be required to complete the specified monitoring of vibration levels and provide a report detailing the vibration levels and copies of the recorded ground vibration documents to the Contractor and the Contract Administrator weekly, or upon request for specific projects.

**Consulting Engineering Firm** means a firm or an individual that has been issued a Certificate of Authorization and a Consulting Engineer designated by the Professional Engineers Ontario.

## **USE OF EXPLOSIVES**

**Designated Blast Area** means the area where the Contractor has notified, in writing, and provided information to all Utilities, public and private property owners, and as the area where the Contractor has made arrangements to evacuate all persons whose safety might be threatened by the blasting operation.

**Engineer** means a Professional Engineer licensed by the Professional Engineers of Ontario to practice in the Province of Ontario.

**Fish Habitat** means as defined by the Fisheries Act.

**Flyrock** means rock that becomes airborne as a direct result of a blast.

**Peak Particle Velocity (PPV)** means the maximum component velocity in millimetres per second that ground particles move as a result of energy released from explosive detonations.

**Pre-Blast Survey** means a detailed record, accompanied by film or video as necessary, of the condition of private or public property, prior to the commencement of blasting operations.

### **120.04 DESIGN AND SUBMISSION REQUIREMENTS**

#### **120.04.01 Design Requirements**

A blast design shall be prepared by an individual or firm with a minimum 5 years experience and be certified by an Engineer. The blast design shall include, at a minimum, the following:

- a) Design PPV and design peak sound pressure level at 100 m radius or nearest Utility, residence, structure, or facility.
- b) Number, pattern, orientation, spacing, size, and depth of drill holes.
- c) Collar and toe load, number and time of delays, and mass and type of charge per delay.
- d) Setback distances to affected fish habitat.
- e) The explosive products to be used.
- f) The designated blast area.

#### **120.04.02 Submission Requirements**

The following shall be submitted to the Contract Administrator:

- a) A minimum of 2 weeks prior to the use of explosives:
  - i. The name and statement of experience of the firm carrying out the blasting.
  - ii. The name of the blaster including a record of experience and safety training.
  - iii. The name of the individual or firm responsible for the blast design, including a record of experience and statement of qualifications.

## **USE OF EXPLOSIVES**

- iv. A letter from an Engineer certifying the design.
  - v. The name of the blast monitoring consultant, including a record of experience and a record of qualifications.
  - vi. A certificate of insurance indemnifying the Owner from all claims and damages arising from the use of explosives.
- b) A minimum of 48 hours prior to the use of explosives:
- i. A letter signed by the Engineer certifying the blast design indicating the areas for which the blast design has been completed.
  - ii. A letter signed by the blaster indicating receipt of the blast design and agreement that the blasting shall be according to the design.
  - iii. A letter signed by the Contractor certifying that a pre-blast survey has been carried out in accordance with the Pre-Blast Survey subsection and a copy of the pre-blast survey
  - iv. A copy of the blast design, including all items shown in the Design Requirements subsection.
  - v. The designated blast area.
  - vi. A blasting schedule.
  - vii. A list of all locations to be monitored.
  - viii. Proof of calibration of all monitoring equipment.
- c) Upon request, any blasting permits, approvals, and agreements required for the use of explosives or to carry out blasting operations.

### **120.05 MATERIALS**

#### **120.05.01 Explosives**

Only explosive products that are approved for use in Canada shall be used.

### **120.06 EQUIPMENT**

#### **120.06.01 Detonation Apparatus**

Detonation apparatus shall be of the type approved by the detonation system manufacturer for the type of blasting operation to be undertaken. All apparatus shall be kept in working order and shall be thoroughly inspected before and after each blasting operation.

All wiring connected to electrical detonation apparatus shall be properly insulated.

#### **120.06.02 Monitoring Equipment**

All monitoring equipment shall be capable of measuring and recording ground vibration PPV up to 200 m/s in the vertical, transverse, and radial directions. The equipment shall have been calibrated within the twelve (12) months prior to commencement of any blasting

## **USE OF EXPLOSIVES**

operations. Proof of calibration shall be submitted to the Contract Administrator prior to commencement of any monitoring operations. Multiple units may be required to establish base readings.

Monitoring equipment shall be according to ISEE Performance Specifications for Blasting Seismographs.

### **120.07 CONSTRUCTION**

#### **120.07.01 General**

Blasting shall be carried out only during daylight hours and at a time when atmospheric conditions provide clear observation of the blast from a minimum distance of 1,000 m. Blasting shall not be conducted on Sundays, statutory holidays, or during electrical storms.

No blasting shall be carried out closer than 30 m of concrete within 72 hours after completion of placement when the ambient temperature falls below 20°C or for 36 hours when the ambient temperature is continuously greater than 20 °C, unless otherwise authorized by the Contract Administrator.

Protection of fish and fish habitat shall be according to the Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters.

Under no circumstances will the Contractor blasé within 3 metres of any utilities without advising the appropriate representative 72 hours in advance of blasting.

No blasting shall be carried out within a distance of 170 meters from any water storage reservoir, pumping station, water works transformer station or water storage tank unless special permission is first obtained from the General Manager, Infrastructure Services Department, or an authorized representative.

No blasting shall be carried out within a radius of 300 meters of any school building during school hours, or any hospital until the superintendent or the person in charge thereof shall have notified a minimum of six (6) hours prior to the commencement of blasting.

No blasting is permitted within the Queensway right-of-way.

#### **120.07.02 Radio-Frequency Hazards**

Prior to blasting, investigations shall be done to determine if radio-frequency hazards exist. Where such hazards exist, necessary precautions shall be taken.

#### **120.07.03 Pre-Blast Survey**

A pre-blast survey shall be prepared for all buildings, Utilities, structures, water wells, and facilities likely to be affected by the blast and those within a minimum of 75m of the location where explosives are to be used. The standard inspection procedure shall include the

## **USE OF EXPLOSIVES**

provision of an explanatory letter to the owner or occupant and owner with a formal request for permission to carry out an inspection.

The pre-blast survey shall include, as a minimum, the following information:

- a) Type of structure, including type of construction, and the date, if possible, when built.
- b) Identification and description of existing differential settlements, including visible cracks in walls, floors, and ceiling, including a diagram, if applicable, room-by-room. All other apparent structural and cosmetic damage or defect must also be noted. Defects shall be described, including dimensions, wherever possible.
- c) Digital photographs or digital video as necessary for recording areas of significant concern.

Photographs and videos shall be clear and shall accurately represent the condition of the property. Each photograph or video shall be clearly labelled with the location and date taken.

A copy of the pre-blast survey limited to a single residence or property, including copies of any photographs or videos that may form part of the report, shall be provided to the owner of that residence or property upon request.

### **120.07.04 Notification**

#### **120.07.04.01 General**

A minimum of 15 Business Days prior to blasting, the Contractor shall provide written notice to Utilities and all owners and tenants of buildings or facilities in urban areas within a minimum of 150 m of the right-of-way or in rural areas, adjoining the blast locations in the right-of-way. In urban areas the Blasting Consultant shall determine if notice distance shall be increased beyond the 150m.

The Contractor shall ensure that a competent person is available to receive, document, and deal with public inquiries before and after blasting operations.

Where potential Utility service disruptions exist, the Contractor shall request the Utility to re-route or temporarily shut down the Utility. When such requests are denied, the Contractor shall request, in writing, that a standby crew be present for the blast. When the Utility refuses to provide a standby crew, the Contractor shall notify the Utility and the Contract Administrator of the intent to proceed and the potential for service disruption. If the Utility objects, the Contractor shall adjust the blast design to prevent disruption.

Where a disruption of power or other services and Utilities may occur, the Contractor shall advise affected users of the Utility or service of the potential disruption and describe

## **USE OF EXPLOSIVES**

how such disruptions will be corrected as soon as is practically possible. When there are a large number of affected users, the Contractor may provide such notifications through the media.

Where power lines or other Utilities are relocated or damaged in the blasting operation the Contractor shall ensure they are restored to their original location or condition as soon as practically possible.

A minimum 48 hours prior to blasting, sufficient detail regarding the blasting operations shall be provided to NAV Canada.

The Contract Administrator shall be provided in writing with a blasting schedule a minimum of 48 hours prior to the start of blasting.

### **120.07.04.02 Utilities**

Authorities of all likely affected Utilities shall be notified a minimum of 72 hours prior to blasting.

### **120.07.04.03 Properties**

Not more than 24 hours and not less than 4 hours prior to each blast, the Contractor shall provide notice of the blasting schedule to all owners and tenants of buildings or facilities in urban areas within a minimum of 150 m of the right-of-way or in rural areas, adjoining the blast locations in the right-of-way. All blasts scheduled for the following 24 hours may be included in one notice. The notice shall include information about the audible blast warning system.

When blasting operations may incur property damage or require temporary evacuation, notification shall include evacuation information and instructions. The Contractor shall take all reasonable steps to ensure that the property owner acknowledges, by their signature, that they have received the information and will comply with any evacuation requirements. Where such signature is withheld, the Contractor shall maintain records showing the date and time that the information was delivered.

### **120.07.05 Monitoring**

#### **120.07.05.01 General**

The Contractor shall employ a blast monitoring consultant to carry out monitoring for ground vibration PPV, peak sound pressure levels and water overpressures as required. During each blast, ground vibration PPV and the peak sound pressure level shall be monitored at the closest structure, or 100 m, from the blast or at the closest portion of any residence, Utility, structure, or facility within this radius. Water overpressure in affected fish habitats shall be monitored adjacent to the shore closest to the blast. The monitoring equipment shall be repositioned as required.

## **USE OF EXPLOSIVES**

### **120.07.05.02 Ground Vibration**

Ground vibrations as measured by PPV shall be limited to the maximum levels shown in Table 1. Should readings from any two consecutive blasts exceed these values or any single reading exceed these values by more than 30 mm/s, all blast operations shall cease until a revised blast design, certified by the Engineer, has been submitted to the Contract Administrator

### **120.07.05.03 Water Overpressure**

Instantaneous pressure change as measured by water overpressure in or near fish habitat shall not exceed 100 kPa.

### **120.07.05.04 Trial Blasts**

The Contractor shall confirm the suitability of the blast design for the ground vibration PPV limits and sound pressure levels by carrying out a minimum of three limited test blasts at locations agreed upon by the Contract Administrator and the Contractor. The trial blasts shall be carried out with appropriate blast vibration and noise level monitoring equipment. Based on the results, the initial blast design shall be revised as necessary to ensure satisfactory levels of shatter depth and flyrock control, and that ground vibrations are within specified limits.

### **120.07.06 Protective Measures**

Immediately prior to the blast, the blast area designated by the blaster shall be cleared of all vehicular and pedestrian traffic.

All traffic shall be stopped and be prevented from entering the area until the blaster gives permission. Traffic control shall be according to the Ontario Traffic Manual, Book 7. Signs shall be posted to inform the public of blasting operations and to turn off radio transmitters. Audible blast warning devices, capable of alerting workers and the public up to a radius of 1,000 m, shall be used before and after blasting.

Blasting mats or other suitable means of controlling flyrock shall be used to limit potential hazardous effects of the blast.

### **120.07.07 Records**

A post-blast record shall be prepared and signed by the blaster for each blast completed. The post-blast record shall report the following conditions and be made available to the Contract Administrator for site review:

- a) The date, time, and location of the blast.
- b) The wind direction and approximate speed at the time of the blast.
- c) The general atmospheric conditions at the time of the blast.
- d) The actual blast details.
- e) PPV, peak sound pressure level, and water overpressure results of each blast according to CAN3-Z107.54.

## USE OF EXPLOSIVES

A report summarizing the results of the vibration and air blast levels shall be submitted to the Contract Administrator at the end of each work day that blasting was carried out.

### **120.07.08 Damage**

Upon completion of blasting or immediately following the receipt of a complaint, a site condition survey shall be performed to determine if any damage has resulted. The Contractor shall record all incidents of any damage or injury, which shall be reported immediately in writing to the Contract Administrator. All other complaints shall be reported to the Contract Administrator in writing within 24 hours of receipt. Each complaint report shall include the name and address of the complainant, time received, and description of the circumstances that led to the complaint. All complaints shall be addressed promptly by the Contractor or his consultant.

### **120.07.09 Responsibility**

This special provision in no way intends to remove any of the responsibility for a safe blasé from the Blasting Contractor.

### **120.10 BASIS OF PAYMENT**

Payment at the Contract price for the appropriate tender items that requires the use of explosives shall be full compensation for all labour, Equipment, and Material to do the work.

When the Contract contains separate items for work required by this specification, payment shall be at the Contract prices and according to the specifications for such work.

The cost of standby crews and equipment required by Utility authorities shall be the responsibility of the Contractor.

### **120.10.01 Claims**

The Contractor shall be responsible for the management of all claims and payment arising from the hauling, handling, use of, and storing of explosives and all effects, directly or indirectly related to the blasting operation.

**TABLE 1**  
**Maximum Peak Particle Velocity Values**

<b>Element</b>	<b>Frequency Hz</b>	<b>PPV mm/s</b>
Structures and Pipelines	≤ 40	20

**USE OF EXPLOSIVES**

	> 40	50
Concrete and Grout < 72 hours from placement	N/A	10