Gas Industry Standard

GIS/E8:2021

Specification for

Searcher bars

Contents

Foreword

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This standard calls for the use of procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Compliance with this engineering document does not confer immunity from prosecution for breach of statutory or other legal obligations.

Mandatory and non-mandatory requirements

For the purposes of a GIS the following auxiliary verbs have the meanings indicated:

can indicates a physical possibility;

may indicates an option that is not mandatory;

shall indicates a GIS requirement;

should indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment needs to be completed to show that the alternative method delivers the same, or better, level of protection.

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Brief history

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1 Scope

This Gas Industry Standard (GIS) specifies requirements for horizontal non-percussion searcher bars and vertical percussion searcher bars for use in bar holing operations. It also specifies the performance requirements for their electrical insulation.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Formal standards

BS EN ISO 683-1, *Heat-treatable steels, alloy steels and free-cutting steels. Non-alloy steels for quenching and tempering*

BS EN ISO 683-2, *Heat-treatable steels, alloy steels and free-cutting steels. Alloy steels for quenching and tempering*

BS EN ISO 683-3*, Heat-treatable steels, alloy steels and free-cutting steels. Case-hardening steels*

BS EN ISO 683-4*, Heat-treatable steels, alloy steels and free-cutting steels. Free-cutting steels*

BS EN 10085*, Nitriding steel. Technical delivery conditions*

BS EN 10095*, Heat resisting steels and nickel alloys*

BS EN 10250-4*, Open steel die forgings for general engineering purposes. Stainless steels*

BS 3054, *Specification for fireman's axe with rubber insulated handle.*

PD 970, *Wrought steels for mechanical and allied engineering purposes — Requirements for carbon, carbon manganese and alloy hot worked or cold finished steels.*

3 Terms and definitions

For the purposes of this standard the following terms and definitions apply.

3.1
retaining plug/cap
plug/end cap at the base of the searcher bar handle, consisting of a threaded plug/cap to hold the spike inside the barrel of the handle; found on vertical percussion searcher bars only.

NOTE: On adjustable depth searcher bars, the retaining plug/cap can be reversed to give spike penetration depths of either 200 mm or 380 mm.

3.2
fixed depth searcher bar
percussion searcher bar with a fixed depth for use vertically on footways, verge or private ground (fixed depth: 200 mm) or roadways (fixed depth: 380 mm).

3.3
adjustable depth searcher bar
percussion searcher bar primarily for use vertically on footways, verge or private ground or

roadways with a depth that can be adjusted to either 200 mm (for footways) or 380 mm (for roadways).

3.4
deep searcher bar
percussion searcher bar with a fixed depth of 800 mm used vertically where a deeper test hole is required to penetrate a thicker road surface or where the gas pipe is known to be well below the normal lay depth for gas pipes.

3.5
horizontal searcher bar
non-percussion searcher bar, consisting of one piece with an electrically insulated handle moulded onto a spike, used horizontally following excavation perpendicular to, or parallel to, the line of an exposed gas pipe.

NOTE: The operative should manually push the bar into the ground until the spike has achieved a suitable horizontal depth.

3.6
non-percussion searcher bar
searcher bar that is manually pushed into the ground horizontally, rather than using a spike moving up and down in a barrel to drive the end into the ground.

3.7
percussion searcher bar
searcher bar with an electrically insulated handle which is vertically raised by the handle and then allowed to drop onto the spike within the barrel to make a test hole by percussive action.

NOTE: The operative keeps hold of the bar at all times during raising and lowering and the pointed spike is driven into the ground by a percussive action until penetration depth is reached. The percussive action involves the shaped steel striking face at the top end of the spike hitting the bottom of the threaded plug (top closure) of steel barrel, which forms part of the inside of the insulated handle (see Figure A.1). This impact causes the pointed spike to be driven down into the ground.

4 General

4.1 Design

4.1.1 The handle of the searcher bar shall be totally electrically insulated with no bare metal. It shall be attached to the searcher bar in such a way that no slippage occurs between the barrel of the handle and the insulation, when the searcher bar is in use.

NOTE: Diagrams of typical searcher bars are shown in Annex A.

4.1.2 The outside diameter of the handle, including insulation but not including the protective flanged ends, shall not exceed 65 mm. There shall be two flanged ends on percussion type searcher bars and a single flanged end on non-percussion type searcher bars (see Figures A.2, A.3 and A.4).

4.1.3 The end of the spike shall be fitted with a rubber foot or plastic protection cap or sheath.

4.2 Materials

4.2.1 The surface of the insulation shall be such that, if it suffers mechanical damage, this damage can be clearly seen.

4.2.2 The conical tip of the bar shall have a hardness of 55 HRC to 60 HRC (Rockwell C hardness scale). It shall conform to BS EN ISO 683 1-4, BS EN 10085, BS EN 10095, BS EN 10250 and PD 970. The case-hardened material of the conical tip shall be applied by hard metal deposition in accordance with BS EN ISO 683-3.

4.2.3 The handle insulation material shall be robust enough to withstand normal site working conditions.

4.3 Penetration

The penetrating end of the searcher bar spike shall be cone shaped, with an included angle of between 30º and 60º.

5 Fixed and adjustable depth searcher bars

5.1 Design

5.1.1 The design shall be such that the bar can penetrate and be withdrawn from the ground in a percussive manner (see Figures A.1, A.2 and A.3).

5.1.2 Fixed depth searcher bars shall combine the use of a retaining cap or plug with the correct spike length to limit the penetration depth to either 200 mm or 380 mm. The bottom end of the retaining cap or plug shall act as the required penetration depth stop.

5.1.3 Adjustable depth searcher bars shall be provided with a retaining cap or plug that can be reversed to select a spike penetration depth of either 200 mm or 380 mm. The bottom end of the retaining cap or plug shall act as a depth stop.

5.1.4 The height of fixed depth searcher bars shall not be less than 1200 mm with the handle at the bottom of its stroke (i.e. in the closed position).

5.1.5 The height of adjustable depth searcher bars shall not be less than 1360 mm with the handle at the bottom of its stroke (i.e. in the closed position).

5.1.6 The minimum stroke length shall be 560 mm. The maximum stroke length shall be 660 mm.

5.1.7 The steel bar for the spike shall have a minimum diameter of 16 mm.

5.1.8 The handle shall not be less than 955 mm in length and not more than 65 mm in diameter.

5.1.9 If a thread is used to retain a retaining cap/plug, a coarse pitch thread shall be used, to transmit the percussive energy without binding.

5.1.10 On the penetration stroke, the internal striking faces of the searcher bar and handle shall be flat to present the maximum contact area. The striking face of the searcher bar shall have a rounded edge.

5.1.11 The bottom end of the bar shall not cause damage to the electrical insulation and retaining cap or plug when hitting the ground at maximum penetration depth. This shall be achieved by ensuring that the design of the retaining cap or plug is robust enough to prevent damage to itself or the electrical insulation at the end of the bar.

5.1.12 The weight of the handle shall be not less than 4.5 kg and the overall weight of the equipment shall be not greater than 10 kg.

5.1.13 The searcher bar shall be fitted with a device to keep the spike in a closed position when not in use, e.g. a securing screw. This shall not be achieved by machining of the spike.

5.1.14 The design shall ensure that no tools, such as a spanner or screwdriver, are required to remove the retaining plug, either for maintenance or to change penetration depths on adjustable depth bars.

5.1.15 The inside surface of the barrel, the outside surface of the handle and the internal striking faces (see Annex A) shall be smooth, free from burrs or sharp corners and clear of any debris from manufacturing processes such as grit blast cleaning.

5.1.16 The searcher bar shall be designed so that the spike moves easily in the barrel or retaining cap/ plug without binding when in use.

5.2 Materials

5.2.1 The steel barrel shall be manufactured from cold-drawn seamless tubing.

5.2.2 The internal striking face at the top end of the spike and the underside strike face of the steel barrel's top end closure plug shall have a hardness of 35 HRC to 40 HRC.

5.2.3 The outer surface of the steel barrel and top end closure shall be electrically insulated with rubber where there is a risk of touching bare metal during use. This shall be provided for the whole length of the searcher bar from the top to bottom flanges.

5.3 Penetration

The searcher bar shall be capable of penetrating to a depth of 200 mm in footpaths and unmade ground and 380 mm in roads.

6 Horizontal searcher bars

6.1 Design

6.1.1 Horizontal searcher bars shall incorporate a depth stop where the moulded handle meets the spike. The handle shall be moulded onto the spike at the correct position so that the depth stop (bottom of handle) shall limit the depth of penetration to a maximum of 375 mm. This depth stop at the bottom of the handle shall be a flange or raised shoulder on the handle. It shall be insulated, and form part of the handle and it shall not exceed 20 mm in length. It shall be included in the tests specified in Clause ***8.***

NOTE: A typical horizontal searcher bar is shown in Figure A.4.

6.1.2 The steel bar for the spike shall have a minimum diameter of 12 mm.

6.1.3 The length of the insulated handle shall be not less than 200 mm.

6.1.4 The surface of the insulation shall be resistant to damage associated with normal field usage and storage.

6.1.5 The overall weight of the horizontal searcher bar shall not be greater than 2.5 kg.

6.2 Materials

The handle shall be made from an insulating material, e.g. polypropylene.

6.3 Penetration

The searcher bar shall be capable of penetrating to its depth limit in compacted clay.

7 Deep searcher bars

7.1 Design

7.1.1. The design shall be such that the bar may penetrate and be withdrawn from the ground in a percussive manner.

7.1.2 The height of the searcher bar with the handle at the bottom of its stroke (i.e. in the closed position) shall not be less than 1700 mm.

7.1.3 The stroke on the bar shall be 280 mm ± 10 mm to facilitate its safe use.

7.1.4 The steel bar for the spike shall have a minimum diameter of 16 mm.

7.1.5 The steel barrel inside the electrical insulation of the handle shall be manufactured from cold drawn seamless tube and shall not be less than 955 mm in length.

7.1.6 The thread used on the retaining cap/plug shall be a coarse pitch thread to transmit the percussive energy without binding.

7.1.7 On the penetration stroke, the internal striking faces of the searcher bar and handle shall be flat to present the maximum contact area. The striking face of the searcher bar shall have a rounded edge.

7.1.8. The bottom end of the bar shall not cause damage to the electrical insulation and retaining cap or plug when hitting the ground at maximum penetration depth. This shall be achieved by ensuring that the design of the retaining cap or plug is robust enough to prevent damage to itself or the electrical insulation at the end of the bar.

7.1.9 The searcher bar shall be fitted with a device to keep the spike in a closed position when not in use, e.g. a securing screw. This shall not be achieved by machining of the spike.

7.1.10 The weight of the handle shall not be less than 4.5 kg and the overall weight of the equipment shall not be greater than 10 kg.

7.1.11 The searcher bar shall be fitted with a device to maintain the bar in a closed position when not in use, e.g. a securing screw. This shall not be achieved by machining of the bar.

7.1.12 The design shall ensure that no tools, such as a spanner or screwdriver, are required to remove the retaining plug for maintenance.

7.1.13 The inside surface of the barrel, the outside surface of the handle and the internal striking faces (see Annex A) shall be smooth, free from burrs or sharp corners and clear of any debris from manufacturing processes such as grit blast cleaning.

7.1.14 The searcher bar shall be designed so that the spike moves easily in the barrel or retaining cap/ plug without binding, when in use.

7.2 Materials

The internal striking faces shall have a hardness of 35 HRC to 40 HRC.

NOTE: This may be achieved by the use of hard facing, surface hardening or other heat treatment processes.

7.3 Penetration

The searcher bar shall be capable of penetrating to a depth of 800 mm in soft ground, or compacted ground, hardcore or rubble within excavations.

8 Type approval tests

8.1 Test schedule

Five searcher bars shall be subjected to the following procedures in the order given:

a) marking as specified in Clause **9**

b) test in conformance to BS 3054 but using a test voltage of 22 kV ac;

c) penetration tests as specified in **8.2.1**;

d) visual examination as specified in **8.2.2**.

None of the searcher bars shall fail to pass any of the tests.

8.2 Penetration tests

8.2.1 Tests for correct operation (in accordance with **5.1.1**, **5.1.16**, **6.1.4**, **7.1.1** and **7.1.14**) and satisfactory spike penetration (in accordance with **5.3**, **6.3** and **7.3**) shall be repeated 10 times. The bar and spike shall be examined visually after each test for any damage or noticeable deterioration in performance. For an adjustable depth searcher bar, the tip and upper strike face should be tested 10 times for each material.

8.2.2 The searcher bar shall be acceptable only if the visual examination shows no deterioration of the tip(s), the striking faces or of the handle.

9 Marking

9.1 Searcher bars conforming to GIS/E8 shall be permanently marked with the following information:

a) the number and date of this standard, i.e. GIS/E8:2021 [1)];

b) the name of the supplier or manufacturer;

c) the manufacturer's contact details;

d) date of electrical test;

e) month and year of dispatch;

f) serial number;

g) where authorized, the product conformity mark of a third-party certification body, e.g. BSI Kitemark.

NOTE: Attention is drawn to the advantages of using third party certification of conformance to a standard.

9.2 The marking shall appear on the insulated handle away from the normal position of the hands and shall be applied before the insulation tests specified in **8.1** to ensure that marking has not damaged the insulation nor impaired its electrical and mechanical properties.

[1)] Marking GIS/E8:2021 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Annex A (informative)
Searcher bars

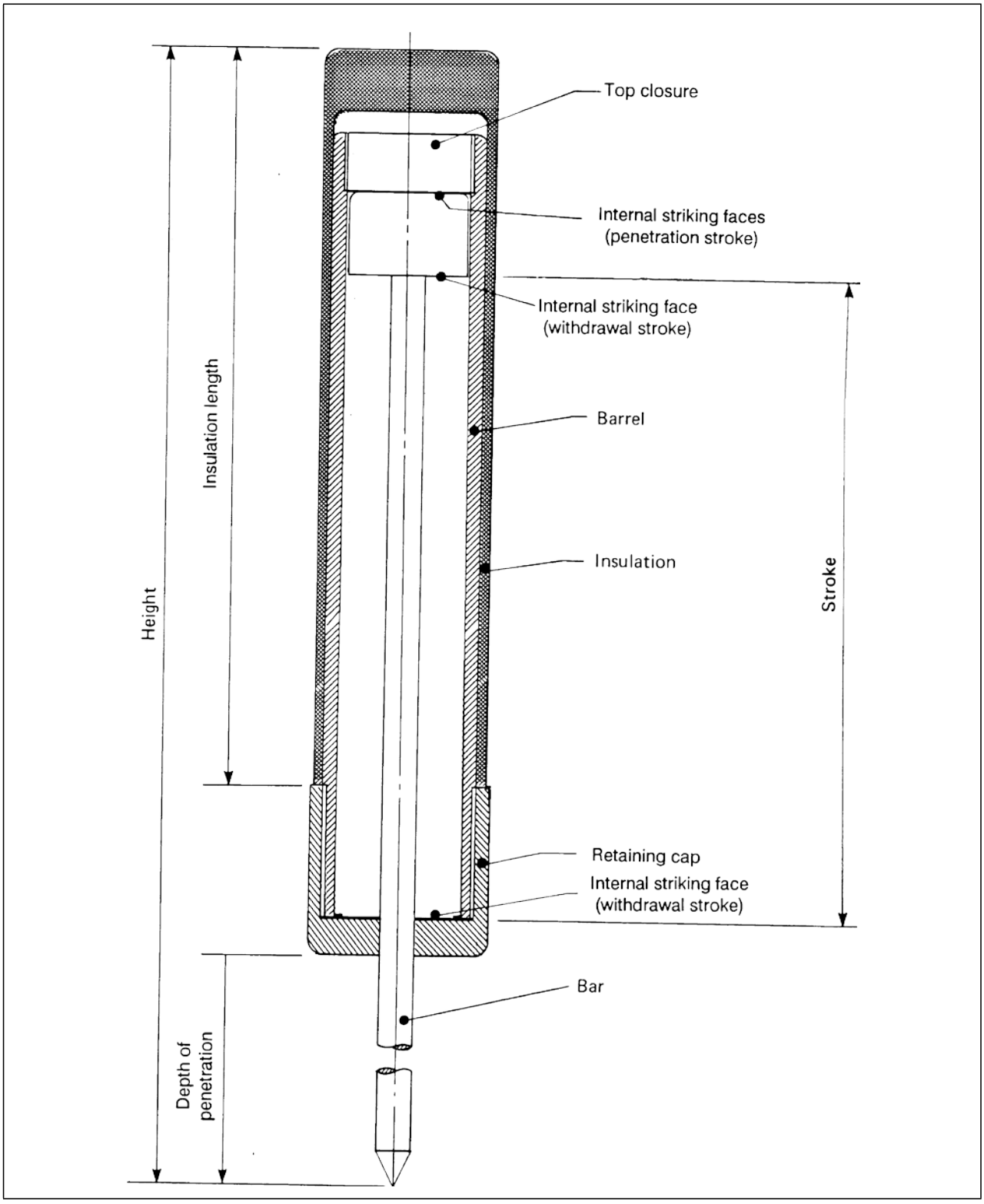

Figure A.1 — Main components of fixed depth searcher bar

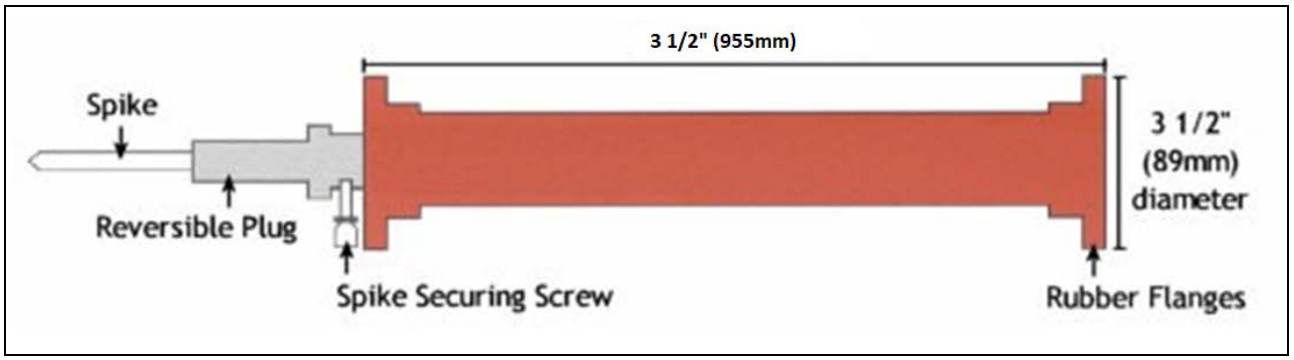

Figure A.2 —Dimensions of adjustable depth searcher bar

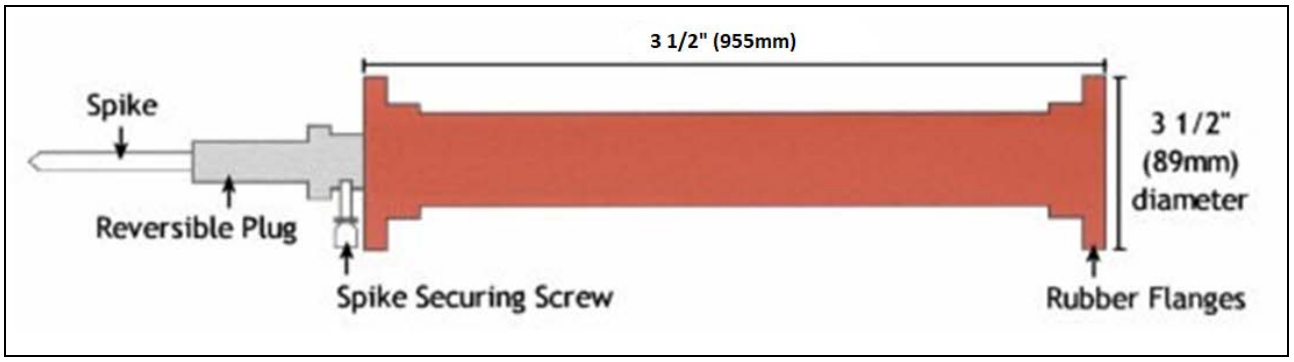

Figure A.3 —Dimensions of fixed depth searcher bar

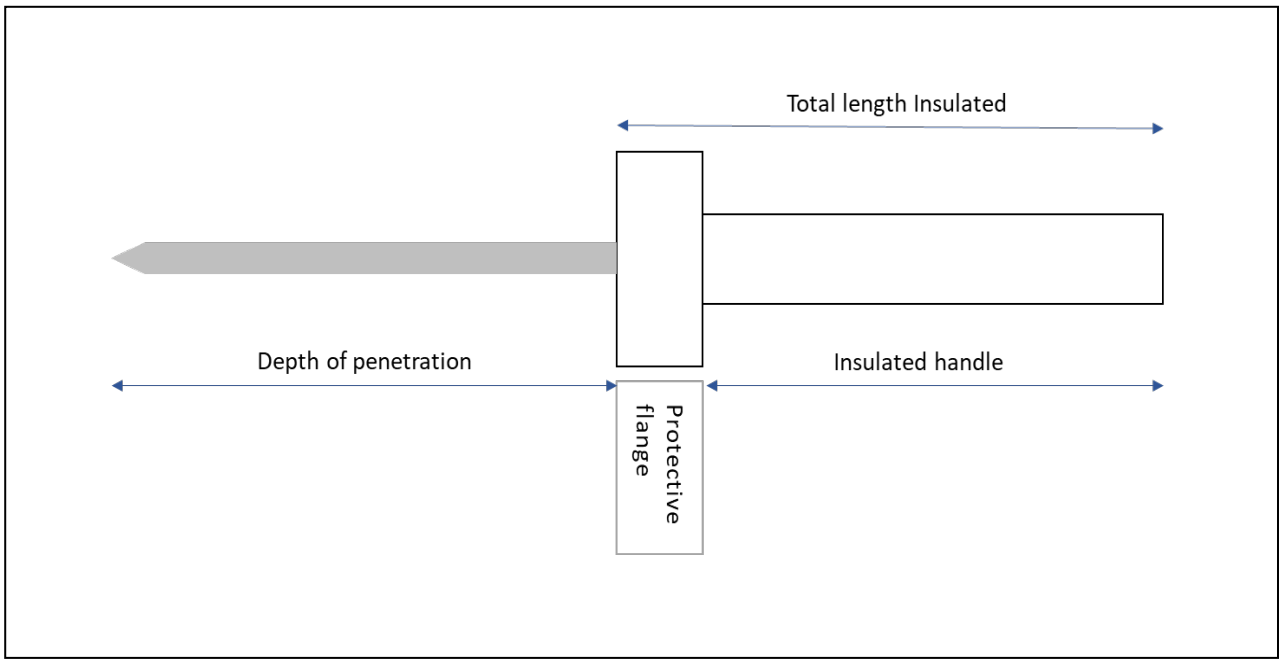

Figure A.4 — Horizontal searcher bar