

Hazard Resilience Index (HRI)

Hazardous Material Spills, Explosions and Leaks

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Hazardous Material Spills, Explosions and Leaks

Please refer to the *Hazard Resilience Index Instructions (HRI)* document for more information on using this document.

Gas Explosions and Gas Leaks

Hazard Resilience Rating	High Resilience <input type="checkbox"/>	Low Resilience <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
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Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based gas explosion and gas leak exercises have taken place with qualified and experienced responders (e.g., table-top or full-scale exercises).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All emergency response personnel have been trained to respond to gas explosions and gas leaks, and have sufficient personal protective equipment (PPE) for all fire fighters and/or have Mutual Aid Agreements in place with neighbouring communities.	<input type="checkbox"/>

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<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gas companies and community officials perform regular safety checks of gas storage structures and distribution systems.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gas companies have replaced all gray cast iron pipes.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system, using various means of communication including social media, in place to notify the community of gas explosions and gas leaks and how to prepare for and respond to them.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of gas explosions and gas leaks.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	When a new project is proposed, the community is fully engaged in the consultation process and has given their free and informed consent prior to siting. The risks associated with the project have been mitigated to the satisfaction of the community.	<input type="checkbox"/>

Mine Explosions

Hazard Resilience Rating	High Resilience <input type="checkbox"/>	Low Resilience <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
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Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Abandoned mines have been permanently sealed off.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based mine explosion exercises have taken place with qualified and experienced responders (e.g., table-top or full-scale exercises).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All emergency response personnel have been trained to respond to mine explosions and have sufficient personal protective equipment (PPE) for all fire fighters and/or have Mutual Aid Agreements in place with neighbouring communities.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mining officials strictly follow all Occupational Health and Safety regulations.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify the community of a mine explosion and how to prepare for and respond to them.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of a mine explosion.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	When a new project is proposed, the community is fully engaged in the consultation process and has given their free and informed consent prior to siting. The risks associated with the project have been mitigated to the satisfaction of the community.	<input type="checkbox"/>

Oil Pipeline Leaks

Hazard Resilience Rating High Resilience Low Resilience Need More Info Not Applicable

Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Closed-circuit security cameras are in place to monitor pipelines and personnel regularly review footage and note any and all concerns whether small or large leaks.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based oil pipeline leak exercises have taken place with qualified and experienced responders (e.g., table-top or full-scale exercises).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Gas companies have replaced all gray cast iron pipes.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The Fire safety team has access to oil absorbents, absorbent pads, mats, pipe flange wraps and other products to minimize the spread and contamination of the soil and waterways.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Local regulations and legislation exist that require the prompt remediation of all spills and contamination.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The pipeline company monitors and replaces unsafe pipeline sections on a regular basis and cleans up any associated spills or contamination.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place, using various means of communication including social media, to notify the community of an oil pipeline leak and how to prepare for and respond to it.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of an oil pipeline leak.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The pipeline company consults with Traditional Knowledge holders and community members about their emergency plans and the reduction of risk to the environment, to identify acceptable levels of risk for the community and to share plans for cleanup of leaks and spills.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	When a new project is proposed, the community is fully engaged in the consultation process and has given their free and informed consent prior to siting. The risks associated with the project have been mitigated to the satisfaction of the community.	<input type="checkbox"/>

Other Explosions

Hazard Resilience Rating High Resilience Low Resilience Need More Info Not Applicable

Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based explosion exercises have taken place with qualified and experienced responders (e.g., table-top or full-scale exercises).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Former live-fire military training facilities have been searched for unexploded munitions that can explode if triggered.	<input type="checkbox"/>

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<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Police or local law enforcement are vigilant in monitoring community for illegal drug manufacturing or fireworks production in private homes or offices and collect evidence to allow for lawful seizure.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify the community of an explosion and how to prepare for and respond to them.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of an explosion.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	When a new project is proposed, the community is fully engaged in the consultation process and has given their free and informed consent prior to siting. The risks associated with the project have been mitigated to the satisfaction of the community.	<input type="checkbox"/>

Hazardous Material Spills – On Site/In Situ

Hazard Resilience Rating	High Resilience <input type="checkbox"/>	Low Resilience <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
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Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community officials perform regular safety checks of hazardous material storage structures including chemicals stored under pressure and report findings to provide record of conditions through time.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based hazardous material spill on site/in situ exercises have taken place with qualified and experienced responders (e.g., table-top or full-scale exercises).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All emergency response personnel have been trained to respond to hazardous material spills and have sufficient personal protective equipment (PPE) for all fire fighters and/or have Mutual Aid Agreements in place with neighbouring communities.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fire fighters and residents have ready access to sites where decontamination can be carried out.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The company has access to products to minimize the spread and contamination of the soil and waterways.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Any organization that stores or uses hazardous materials has consulted Traditional Knowledge holders and community members on how to reduce risk and attain acceptable risk levels as well as to get input for the development of appropriate emergency plans.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The company has trained Hazardous Material Response Teams on site.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place, which uses various means of communication including social media, to notify the community of a major hazardous material spill on site/in situ and appropriate responses.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of a hazardous material spill on site/in situ.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	When a new project is proposed, the community is fully engaged in the consultation process and has given their free and informed consent prior to siting. The risks associated with the project have been mitigated to the satisfaction of the community.	<input type="checkbox"/>

Hazardous Material Spills – Air Transport

Hazard Resilience Rating	High Resilience <input type="checkbox"/>	Low Resilience <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
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Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community emergency response plans cover response to all vehicles (marine, road or rail) carrying dangerous cargo that spill in the community.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based air transport hazardous material spill exercises have taken place with qualified and experienced responders (e.g., table-top or full-scale exercises).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place, using various means of communication including social media, to notify the community of a hazardous material spill via air transport.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of a hazardous material spill via air transport.	<input type="checkbox"/>

Hazardous Material Spills – Land Transport

Hazard Resilience Rating	High Resilience <input type="checkbox"/>	Low Resilience <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
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Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Centre line guardrails, safer intersections and wider road shoulders are in place in problematic areas.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Roundabouts are in place to improve the flow of traffic.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based hazardous material spills exercises, involving road and rail transport, have taken place with qualified and experienced responders (e.g., table-top or full-scale exercises).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All emergency response personnel have been trained to respond to hazardous material spills and have sufficient personal protective equipment (PPE) for all fire fighters and/or have Mutual Aid Agreements in place with neighbouring communities.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Emergency response personnel and residents have ready access to sites where decontamination can be carried out.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Transport Police conduct regular safety checks on vehicles carrying hazardous materials.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Police regularly monitor traffic for impaired drivers.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Speed cameras or warning signs (in multiple languages as necessary) are located in places subject to speeding on transportation routes used by trucks carrying hazardous materials.	<input type="checkbox"/>

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community has reduced speed limits and/or lower speed zones in areas where hazardous materials are being transported.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community limits travel of trucks carrying hazardous material in core areas.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The fire safety team in the community or nearby has access to products to minimize the spread and contamination of the waterways and beaches.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The fire safety team in the community or nearby has trained Hazardous Material Teams available for deployment.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify the community of a hazardous material spill involving land transport and how to conduct themselves in preparation and response.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of a hazardous material spill involving land transport.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Land transport companies consult traditional knowledge holders and other community members for information on acceptable risk levels and reporting needs.	<input type="checkbox"/>

Hazardous Material Spills – Marine Transport

Hazard Resilience Rating	High Resilience <input type="checkbox"/>	Low Resilience <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
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Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based hazardous material spills involving marine transport exercises have taken place with qualified and experienced responders (e.g., table-top or full-scale exercises).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All emergency response personnel have been trained to respond to hazardous material spills and have sufficient personal protective equipment (PPE) for all fire fighters and/or have Mutual Aid Agreements in place with neighbouring communities.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If applicable, harbour masters are familiar with the harbour and are available to board and navigate ships to avoid accidents (e.g., grounding).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Marinas have warning systems in place to notify boat operators of potential heavy fog or storms, shallow areas and hazards under the water.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Port Authority Officials perform regular safety checks of storage structures (e.g., gas and oil barges) in marinas and harbours.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The fire safety team has ready access to products to minimize the spread and contamination of the waterways and beaches.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The fire safety team has trained Hazardous Material Teams available in the community or nearby for deployment.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place, using various means of communication including social media, to notify the community of a hazardous material spill involving marine transport and how to conduct themselves in preparation and response.	<input type="checkbox"/>

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of a hazardous material spill involving marine transport.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Marine transport companies consult Traditional Knowledge holders and other community members for information on acceptable risk levels and reporting needs.	<input type="checkbox"/>

Hazardous Material Spills – Rail Transport

Hazard Resilience Rating	High Resilience <input type="checkbox"/>	Low Resilience <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
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Yes	No	Need More Info	Not Applicable	FACTORS	This factor is important to my community
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community-based hazardous material spill involving rail transport exercises have taken place with qualified and experienced responders (e.g., table-top or full-scale exercises).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Saw Bucks made of contrasting materials are in place to clearly mark rail crossings along road side for both cars and pedestrians.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Development regulations in areas susceptible to rail derailments limit land use, or prohibit development.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	All emergency response personnel have been trained to respond to hazardous material spills and have sufficient personal protective equipment (PPE) for all fire fighters and/or have Mutual Aid Agreements in place with neighbouring communities.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community officials register with CANUTEC (Transport Canada) to get aggregate annual rail safety information and remain informed of rail company safety practices to be able to advocate for compliance with regulations.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Rail companies consult traditional knowledge holders and other community members for information on acceptable risk levels and reporting needs.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Railway warning systems are visible prior to reaching the crossing and maintained by the rail owner.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The community is working with <i>Operation Lifesaver</i> , a national public education program for railway safety, which works with communities to reduce rail collisions.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The fire safety team has access to products (in the community or nearby) to minimize the spread and contamination of the soil and waterways.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The fire safety team has trained Hazardous Material Teams available in the community or nearby for deployment.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The fire safety team is aware of the quantity and type of hazardous materials travelling by rail in close proximity to the community.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place (including social media, door-to-door canvassing, etc.) to notify the community of a hazardous material spill involving rail transport.	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	There is a warning system in place to notify emergency response personnel of a hazardous material spill involving rail transport.	<input type="checkbox"/>

References

- Melchers, R. E. (2002). Safety and risk in structural engineering. *Prog. Structural Engineering Mater*, 4, 193-202.
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- Wang, J. (2006). Maritime risk assessment and its current status. *Quality and Reliability Engineering International*, 22, 3-19.