Field Construction Safety

The Evacuation Point was designed to eliminate the possibility of it tipping over under robot weight; it is approximately 1 foot wider than it is tall. It is designed with 6 separate poles to make transport and storage easy while also minimizing assembly work. To assemble, volunteers must bolt the poles together and attach a base to each pole to anchor the structure to the carpet.

Game Safety

Operation Radiation includes many rules intended to prevent dangerous robot actions and maintain safety. Robots climb in the center of the field, ensuring they are never in danger of swinging into a dangerous location. The balls that represent coolant were chosen in part for their foam makeup, which means that any errant shots will not cause injury to spectators or volunteers. Additionally, game rules are in place to limit dangerous robot actions, including the launching of fuel rods. Overall, the game rules and design were constructed in a way that allows teams, spectators, and volunteers to remain safe while experiencing the hardest fun they'll ever have.

How Operation Radiation Differs From Past FRC Games

The game designers of Operation Radiation went to great lengths to design a creative and novel FRC game that also retained some element of familiarity for teams. The two unique game elements provide a perfect example of this mix. The fuel rods-PVC pipes-provide a fresh challenge for FRC teams. Their narrow profile and cylindrical shape are unlike most game pieces of the past such as cubes or balls. The gatorskin balls that make up coolant, meanwhile, closely resemble the game pieces of recent games, giving teams the chance to call on past knowledge and technical expertise. Perhaps the most apparent difference between Operation Radiation and past FRC games is its unique but understandable scoring system. Operation Radiation incorporates the idea of diminishing returns to the scoring input. This forces teams to make choices about how many fuel rods they deposit into enclosures and when they choose to decontaminate. Moreover, the dependency of fuel rods on coolant places pressure on teams to consider and account for scoring both game pieces. The decontamination period itself is an area of nuance as well; delays in the availability of field elements places limits on teams, and offers more scoring strategies than past FIRST games. Finally, the field elements, especially the evacuation point, provide a complex yet exciting challenge for teams.

Scoring Table

Task	Description	Auto	Teleop	Qual.
INITIATION LINE	Leave alliance's INITIATION LINE	5	-	-
COOLANT	Scored in UPPER PIPE	2	1	-
	Scored in LOWER PIPE	2	1	-
	Scored in SMALL PIPE	4	2	-
FUEL RODS	Scored in ENCLOSURE 1 & 2 (First 5)	-	4	-
	Scored in ENCLOSURE 1 & 2 (Next 5)	-	2	-
	Scored in ENCLOSURE 3 (First 5)	6	6	-
	Scored in ENCLOSURE 3 (Next 5)	3	3	-
ENDGAME	HANG (per ROBOT)	-	20	-
	PARK (per ROBOT)	-	5	-
	Per ROBOT above 18″	-	10	-
FOULS	Foul	5	5	-
	Tech Foul	15	15	
RANKING POINTS	Activate all 3 enclosures during the MATCH.	-	-	1 RP
	Score 65 ENDGAME points	-	-	1 RP
	Tie game	-	-	1 RP
	Win game	-	-	2 RP

Other Relevant Quantities

Category		Requirement
COOLANT	1 DEGREE	2 in UPPER or SMALL PIPE
	1 DEGREE	3 in LOWER PIPE
ENCLOSURES	Open ENCLOSURE #2	4 DEGREES total
	Open ENCLOSURE #3	10 DEGREES total
	Total ENCLOSURE Capacity	10 rods
	Decontamination time	20 seconds
Robot capacity restrictions	Max number of rods in robot	3
	Max number of coolant in robot	3
	Max number of preloaded rods	3
	Max number of preloaded coolant	3
Loading Station	Max number of stored coolant	15

Relevant Game Information/Rules

Field Size

- The Operation Radiation field, including driver stations and space for human players, measures 30′x74′x9′

Match Timing

- Matches last 2 minutes and 30 seconds - 15 seconds of Autonomous, 105 seconds of Teleoperated, and 30 seconds of Endgame

Gameplay Restrictions

- ROBOTS may not enter the EVACUATION ZONE during AUTO. (Violation: FOUL, if contact with opponents robot, TECH FOUL)
- ROBOTS may not interfere with the opposing ALLIANCE'S PIPES or ENCLOSURES. (Violation: TECH FOUL)
- ROBOTS may not put FUEL RODS into a DISABLED enclosure. (Violation: TECH FOUL)
- ROBOTS are prohibited from extending more than 45″ above the carpet at any point prior to ENDGAME (Violation: TECH FOUL)

Protected Zones

- During teleop, the EVACUATION ZONES are not protected. During endgame a ROBOT may not contact an opponent ROBOT whose bumpers are intersecting the EVACUATION POINT. (Violation: TECH FOUL)
- A ROBOT whose BUMPERS are intersecting the opponent's LOADING ZONE, PIPE ZONE, or ENCLOSURE ZONE may not contact opponent ROBOTS, regardless of who initiates contact. (Violation: FOUL)
- Give opponents some space. An opponent ROBOT may not contact a ROBOT whose BUMPERS are intersecting its LOADING ZONE, PIPE ZONE regardless of who initiates contact. (Violation: TECH FOUL)

Game Piece Interaction

- ROBOTS may not have greater-than-momentary CONTROL of more than 3 COOLANT and 3 FUEL RODS at a time.
- A ROBOT whose BUMPERS are fully contained by their opponent's SECTOR may not cause COOLANT to travel into or through their SECTOR. (No full field shots)
- Robots may not use game pieces to deliberately obstruct opposing robots or violate the frame perimeter of opposing robots.
- ROBOTS may not be designed to shoot a FUEL ROD such that it travels more than 3′ horizontal beyond its frame perimeter (Violation: RED CARD)
- A ROBOT is considered PARKED if, 5 seconds after the ARENA timer displays 0 following TELEOP, its bumpers are fully contained by the EVACUATION POINT, but it has not met the criteria for HANGING.
- A ROBOT is considered HANGING if, 5 seconds after the ARENA timer displays 0 following TELEOP, it is fully supported by the chain.
- A ROBOT earns a 10 point bonus if, 5 seconds after the ARENA timer displays 0 following TELEOP the lowest point of the ROBOT is HANGING above 18″. The final assessment of a COMPLETE EVACUATION and HANGING or PARKED ROBOTS is made 5 seconds after the ARENA timer displays 0 following TELEOP. Teams are encouraged to ensure that their robot is CLEARLY above the 18″ so REFEREES can assess the climb.

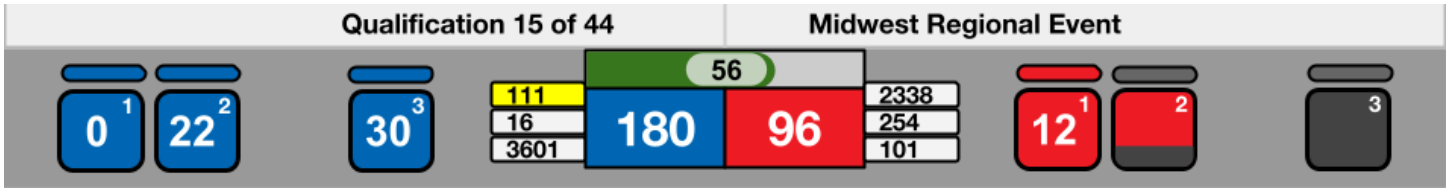
Human Restrictions

- HUMAN PLAYERS may move between the ALLIANCE STATIONS and behind the ENCLOSURE ZONES. When traveling between alliance stations and ENCLOSURES, human players must practice certain safety measures, and avoid running and interfering with referees, game elements, or other features.

Signaling

- LED's will round the perimeter of the front face and top face of the ENCLOSURES.
    - No light to signify that ENCLOSURES are CLOSED
    - Solid Blue color on the lower LED panel to signify that five fuel rods or fewer have been deposited.
    - Solid Blue color on upper LED panel to signify that more than five fuel rods have been deposited.
    - Solid Orange color to signify that ENCLOSURES are at FULL CAPACITY
    - Flashing Orange signifies that an ENCLOSURE is DECONTAMINATING
- Two strips of LEDs form vertical lines on the sides of the PIPES.
    - All 10 LED's are fully lit to start the match. For each degree that is earned the uppermost LED goes out.
    - When an enclosure is activated, the color of the LEDs will flash green for 3 seconds.
- Evacuation Point
    - At T=0 all field LEDs turn yellow and flash each second to assess scoring. Turn off at T>+5.

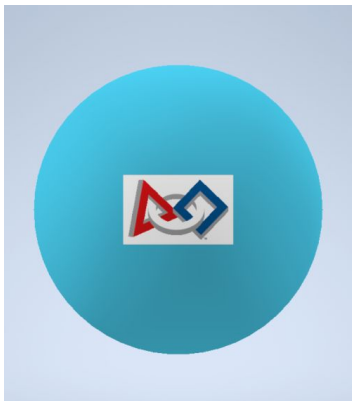
Scoreboard

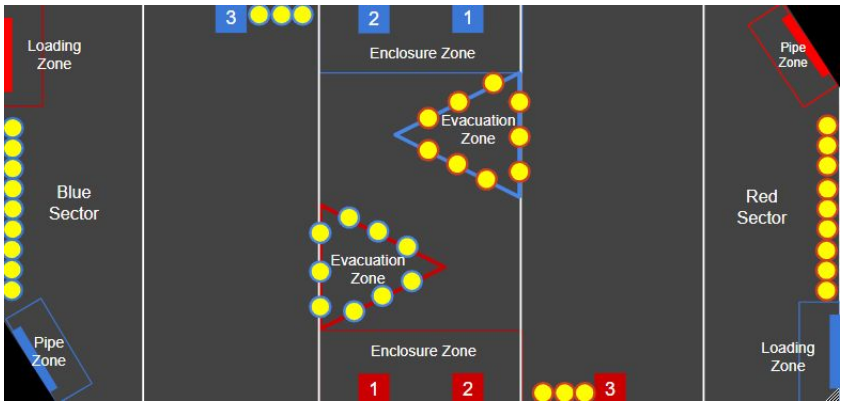


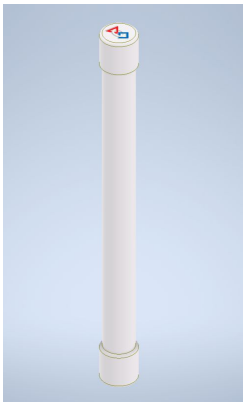
Enclosure Boxes fill from top to bottom as alliances lower temperatures. A filled box with a number and a solid marking above it is an activated enclosure. While an enclosure is decontaminating, the marking above the box flashes between gray and alliance color before the alliance score is increased by the points in the enclosure and the enclosure number becomes 0.

Game Piece Logistics

(Coolant are enlarged colored for ease of viewing)







Coolant Logistics

- A minimum of 24 coolant balls start on the field prior to match start.
    - 9 coolant balls spaced evenly on the perimeter of the evacuation zone.
    - 3 coolant balls lined up along the side walls adjacent to Enclosure 3.
    - 9 balls corresponding to 3 potential preloads per robot can be lined up along the alliance station wall.
- 10 coolant balls start in each loading station.
- Each station can hold a maximum of 15 coolant during teleop; excess coolant must be recycled onto the field.

Fuel Rod Logistics

- No fuel rods begin on the field prior to match start; all fuel rods are collected from the loading stations.
- Up to 9 fuel rods (3 per alliance member) may be preloaded in a robot prior to match start.
- 32 Fuel Rods are prepared in each loading station not including preloaded items.
    - Alliances are not restricted in how many fuel rods they may hold in the loading station at any given time.

All dimensions are in inches. The Chain ELEMENT's are not depicted in the drawings but are looped through openings in Evacuation Point 6.5′ above ground.