



## 2018 Fire Fighting Challenge

This challenge concludes in a **single elimination tournament** **Top 8 teams** from each division, based on scores, will compete for awards

### Goal

To design, build, and program a robot that can locate and extinguish without touching the 4 randomly placed candles inside a field outlined by a white & black line.

### Who Can Play

Teams in this challenge compete in **one division**, typically:

- Middle School + High School + Big Kids

### Requirements

Autonomous robot, any platform, costing \$1,500 USD or less, and meets the following design constraints, which will be **verified during Check-In**:

- Robot can demonstrate it is running a program that can control the start and stop of its extinguishing system via a sensor that interacts with either the candle or the circle the candle is placed on.
- If using a high speed propeller, robot must have a safety guard in place.
- Multiple sensors and processors are allowed.
- Volume of the robot must **not** exceed  $65030cm^3$ .

### General Rules of Play

- Robot will start each heat at a spot along the border as chosen by the challenge coordinator.
- The first candle will be in plain view of the robot at the start of the challenge.
- The robot has 3 minutes to extinguish the 4 candles.
- Only players can operate and manipulate the robot during the heat
- If a player touches the robot after the challenge has begun, the time stops, the run **ends**, and the challenge will be scored based on the number of candles extinguished when the robot was touched.
- Official tracks will be available to practice on when not in use by competitors attempting an official run.
- You will get **10 official scored runs** during the challenge scoring period.
- The **total of your 5 highest official scores** are used to determine tournament selection.

## Challenge Specifications

### The Track

- Challenge field is  $2.4m \times 3.5m$ .
- A border will be constructed using white and black duct tape.
- The border's white duct tape will be  $7.5cm$  wide with a  $2.5cm$  black duct tape line down the center of the white tape.
- Candles and walls will be randomly placed for every run.

### The Candles

- The candles stand at the center of a white vinyl circle, indicated by a  $5cm$  diameter black circle, with varying heights between  $10cm$  and  $45cm$ .
- The circle has a  $40cm$  diameter, and has a  $2.5cm$  black line that is  $2.5cm$  in from the outer edge.
- Candles blocked by walls:
  - o 1 candle - No wall
  - o 1 candle - 1 wall (see right)
  - o 1 candle - 2 walls
  - o 1 candle - 3 walls



### The Walls

- The wall widths vary from  $20cm$  to  $35cm$  and are  $40cm$  tall. They are held up by wooden bases that are  $3.5cm$  tall and may span the approximate width of the wall.

*All Challenge Dimensions are Approximate*

The challenge may be held in areas with natural light present which may change the lighting conditions of the track. **Be prepared** to engineer around this natural condition.

## Scoring

The “remaining time bonus” is awarded, **if and only if**, all four candles are extinguished. Otherwise, the team receives **only** the points for candles extinguished.

### Penalty Rules:

- 50% off the candle’s value, **if**:
  - A candle is extinguished by the robot when it is completely **outside** the circle
  - The candle is touched **during the process** of extinguishing the flame.
- The process of extinguishing the lit candle is defined as: Entering into the circle, extinguishing, and leaving the circle... **during** this time the robot can not make contact with the candle.
- Previously extinguished candles become obstacles in the playfield, and **do not count** as a penalty when touched.

See the scoring matrix below for details on how points are assessed during your run.

### Scoring Matrix

	Number of candles extinguished				Total Possible Score
	First	Second	Third	Fourth	
<b>Half points due to penalty*</b>	50	100	150	200	1000
<b>Full Points</b>	100	200	300	400	
Time Bonus: Clock counts down from 180 seconds and stops when the robot extinguishes the fourth candle					0 - 180

## Tournament Scoring

- The top eight teams will compete in the final tournament.
- Advancing teams will be seeded into the tournament bracket according to their aggregate score (see bracket below).

