# eCREW

## Sun and Heat Safety System

The eCREW system aims to reduce the likelihood and severity of sun burn and heat illness in outdoor workplaces. It consists of a mobile application used by a supervisor, and wearable devices worn by his or her workers.

The system uses sensors for environmental temperature, humidity and UV radiation (housed in the device body), and for core body temperature and heart rate (using the retractable patch).

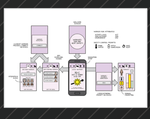
Sensory data is sent to the app via Bluetooth, processed to provide individual 'risk metrics' (activity, radiation and environment), and used to prompt simple control measures ('drink water', 'apply sunscreen' and 'have rest').


The app provides worker monitoring, event notification, manual prompting, local weather information and a device connection system. A prototype can be viewed at: https://tinyurl.com/ya4mgpc6

The device has large lights for prompting (along with creating sound and vibration), a joystick style knob for operation, and a clip on the rear. It has been styled to look like both a protective shield and a typical power tool.

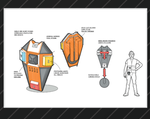
## Development

the processes involved were...



### Planning

Project 2 began with the chosen 'side scrolling' app and 'shield' device concepts from Project 1. A detailed plan was made to develop these further through prototyping and testing.



### Test App Creation

A prototype was drawn in Illustrator and made interactive using Adobe XP. This presented mainly static screens to demonstrate an otherwise complex and dynamic application.

### Test Device Construction

A prototype was CAD modelled in Solidworks and templates used to create a device model from MDF, foam and sheet metal. The light and sensor layout were more appropriately configured and a retracting mechanism added.

### User Testing and Gathering Insights

A behavioural test procedure was produced, carried out with five participants, and used to identify potential usability issues. Those found included: Understanding the app guide screen, navigating multiple workers and connecting new devices. And, discovering the device interaction strategy, adjusting the cord, clipping it securely and working with the protruding lights.

### Making Design Improvements

The observation and feedback notes were analysed and synthesised, resulting in numerous options for improvement. The app design was refined to have a: clearer guide screen, second level of navigation for worker selection, revised connection system, and improved iconography. The device design was refined to have a: more intuitive knob, top patch with front button, proper springed clip, more compact lights, and a subtle curved form.

### Presentation App Creation

The final prototype was again created using Illustrator and XP. The application state tells the story of a typical scenario involving 3 workers, during 5 hours of work, on a hot day.

### Presentation Device Construction

The final prototype was CAD modelled in Solidworks, seven parts were 3D printed, prepped and painted, acrylic lights laser cut, etched and polished, and additional tech pack parts sourced and assembled.

## Scenarios

examples of operation include...

**Peter**
(Supervisor with app)

**Luke, John and Mark**
(Workers with devices)

**Connect New Worker** - John has joined the work crew

Peter opens the app and John installs his device

John holds the knob down until the device turns on

John's device produces a unique, identifying light sequence

Peter presses the 'Connect New Worker' icon to go to that screen

Peter enters John's name

Peter selects John's skin tone

Peter selects the corresponding available device

Peter presses the connect button

**Automatic Prompt** - Luke's body temperature is abnormally high

Luke's device illuminates the red light, makes sound and vibrates

Peter is alerted via a notification, which he presses to follow

Peter views Luke's 'Risk Metrics' to confirm the situation

Luke begins resting and moves the knob upwards to clear the prompt

**Manual Prompt** - Mark will require sunscreen soon after the lunch break



Peter notices Mark's 'Radiation' risk is getting high

Peter presses the 'Apply Sunscreen' activate button

Mark's device illuminates the yellow light, makes sound and vibrates

Mark applies sunscreen and moves the knob to the right to clear the prompt

**Low Battery and Reconnect** - Mark requires another fully charged device

Peter is alerted via a notification, that Mark's device battery is low

Peter gets Mark to hold the knob down on his device until it turns off

John is disconnected and his 'Monitor Worker' screen is removed

John installs a different device and turns it on

Peter presses the 'Connect Previous Worker' icon to go to that screen

Peter selects John from the list

Peter selects the corresponding available device

Peter presses the connect button

**Unsolicitated Action** - John is thirsty

John has a drink of water and moves the knob to the left

Peter is shown this action within the notifications