

# NTDP Tech Tips

## Women’s Firefighter Pants Reintroduced

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### Introduction

In 2019, wildland firefighters responded to a Firefighter Flame-Resistant Pants Questionnaire. The feedback indicated a need for a women-specific pants option. As a result, the U.S. Department of Agriculture, Forest Service is reintroducing pants designed specifically for female wildland firefighters, which will be available to order from the Defense Logistics Agency (DLA) in 2022.

### History

In the 1990s, women-specific wildland firefighter pants manufactured to Forest Service specifications were available through the National Interagency Support Cache (NISC) system and the General Services Administration (GSA) Wildland Fire Equipment Catalog (figure 1). With the redesign of firefighter pants in 1999 to the battle dress uniform (BDU) style, the sales of women’s pants dropped drastically. The women’s pants option was removed from the system in the early 2000s because most women preferred the unisex BDU-style pants (figure 2).

### Highlights

- Feedback from a 2019 questionnaire about flame-resistant wildland firefighter pants indicated a need for a women-specific wildland firefighter pants option.
- The U.S. Department of Agriculture, Forest Service, National Technology and Development Program worked with the U.S. Army Combat Capabilities Development Command Soldier Center and Propper International to develop women-specific wildland firefighter pant prototypes and performed a wear test evaluation.
- The Forest Service is reintroducing pants designed specifically for female wildland firefighters.



Figure 1 — Previous women-specific wildland firefighter pants.



Figure 2—Legacy, unisex, battle dress uniform style pants.

## Process

NTDP periodically reviews items available through DLA and the NISC system that have associated Forest Service specifications. In 2019, NTDP released a wildland firefighter survey to initiate a review of the Forest Service-specification, legacy, unisex, BDU-style wildland firefighter pants. NTDP received more than 1,000 responses from firefighters across the National Wildfire Coordinating Group (NWCG) Federal agencies and many State and local fire departments. Males were generally satisfied with the legacy, unisex pants. Some women gave the legacy, unisex pants high ratings; however, most of the 171 female respondents' ratings showed a need to improve the fit and function with a women-specific wildland firefighter pants design.

The U.S. Department of Agriculture, Forest Service, National Technology and Development Program (NTDP) manages specifications for many of the wildland fire equipment items available through the DLA and the NISC system. Specifications contain detailed information about components used, construction instructions, and inspection criteria. Technical drawings contain overview illustrations, patterns, and construction details. DLA uses this information package for contracting end-item manufacturers.

NTDP entered into an interagency agreement with the U.S. Army Combat Capabilities Development Command (DEVCOM) Soldier Center clothing development team to leverage their clothing design expertise and experience. The U.S. Army recently introduced a women-specific army combat uniform (ACU-F).

Using the expertise of DEVCOM and Propper International (the current unisex pants manufacturer), NTDP equipment specialists designed two styles of prototype pants. One hundred twenty pants were manufactured and NTDP distributed them for a wear test evaluation during the 2020 fire season. One of the prototype styles was based on the old-style military BDU (MIL-T-44047E) pants, whereas the second prototype style was based on the ACU-F design (figure 3). Female wear testers gave both styles favorable evaluations.



Figure 3—Reintroduced women-specific wildland firefighter pants prototype based on the women-specific army combat uniform.

NTDP equipment specialists reviewed wear test evaluation results, and in January 2021, the Forest Service, Washington Office, Fire and Aviation Management program approved moving forward with developing a new specification based on the ACU-F design. DLA will use the Forest Service specifications for contract manufacturing.

### Garment Design

In the 2019 survey, women generally rated the fit of the front rise and back rise (see [Definitions](#)) of the legacy, unisex pants as “too long.” In the 2020 prototypes wear test data, most wear testers rated the fit of the front rise and back rise as “just right” (figure 4). With additional sizing choices, the number of “just right” ratings would likely increase.

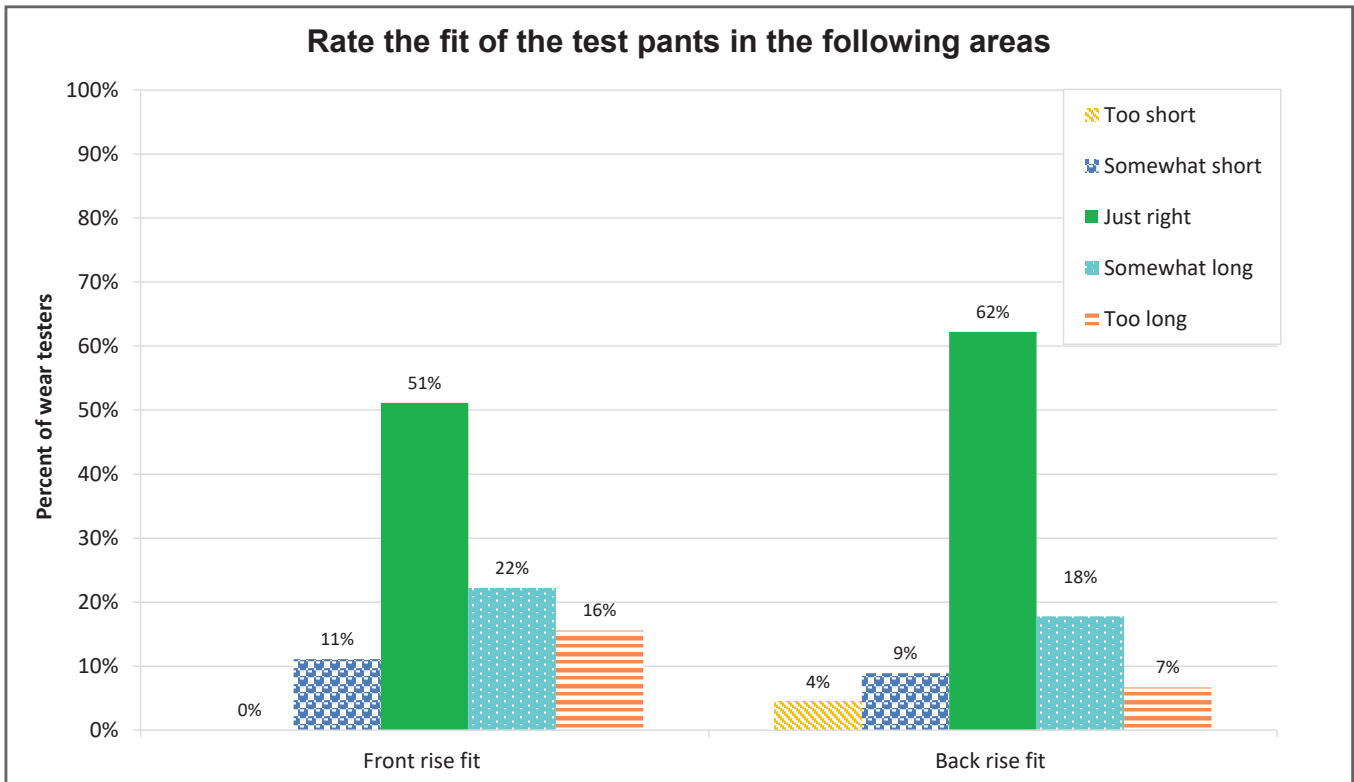


Figure 4—Wear test evaluation results for the fit of the front rise and back rise of the reintroduced women-specific wildland firefighter pants prototype.

## Definitions

**Front rise**—The distance between the crotch/back/inseam junction and the top of the front of the waistband.

**Back rise**—The distance between the crotch/back/inseam junction and the top of the back of the waistband.

The reintroduced women’s-specific wildland firefighter pants have an elastic stretch feature on the back side of the waistband. Wear testers preferred the elastic stretch feature over the adjustment buckles on the waistband of the legacy, unisex design. The front panel articulation at the knee area is another feature that eases fire-work movements.

The cargo pockets are located as high as possible on the pant leg and are designed to fit a folded incident action plan (IAP). A smaller, internal sleeve inside of each cargo pocket conveniently holds an Incident Response Pocket Guide (IRPG) or most

smartphones. To accommodate the higher cargo pocket placement, the rear pockets are designed as hanging bag pockets rather than the typical patch pockets of the legacy, unisex design.

## Fabric

The reintroduced women-specific wildland firefighter pants prototypes were constructed of the same fabric as the type I unisex pants—6.8 ounce per square yard, twill, meta-aramid (Nomex IIIA) blend; this fabric is a proven performer. Wear testers were asked to compare the radiant protective performance (RPP) of the fabric with their reasonable maximum exposures. A reasonable maximum exposure is the maximum amount of radiant heat (from proximity to flames) a wildland firefighter experiences while performing basic fireline work without suffering a thermal injury. Most wear testers rated the RPP of the fabric as “just right” (figure 5). The fabric has an RPP rating of 9, which exceeds the National Fire Protection Association (NFPA) 1977 Standard on Protective Clothing and Equipment for Wildland Firefighting minimum RPP rating of 7.

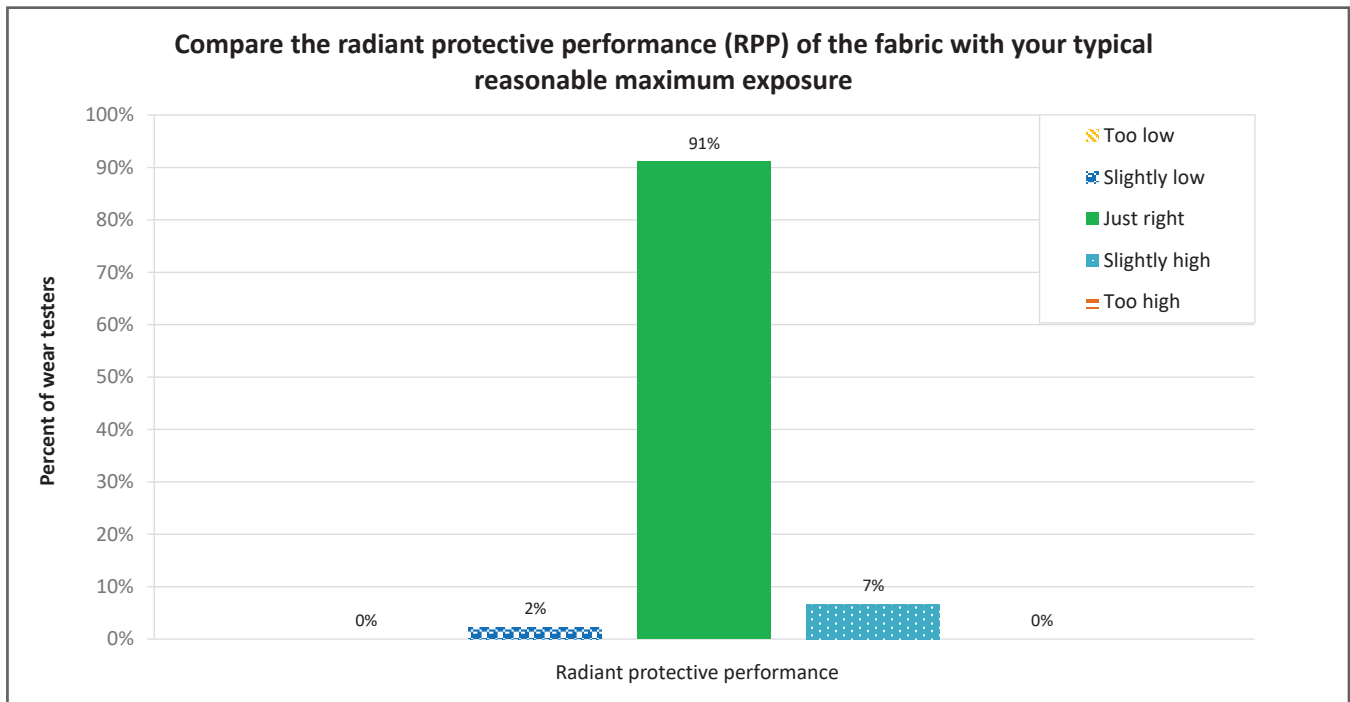


Figure 5—Wear test evaluation results for the radiant protective performance of reintroduced women-specific wildland firefighter pants prototype fabric.

Another factor of the fabric is the total heat loss (THL) rating—the ability of the fabric to dissipate the wearer’s body heat. The fabric has a THL rating of 680 watts per square meter (W/m<sup>2</sup>), which far exceeds the NFPA 1977 standard minimum rating of 500 W/m<sup>2</sup>.

## Sizing

The women-specific wildland firefighter pants will be certified to the National Fire Protection Association (NFPA) 1977 standard. There will be a planned total of 18 sizes available (table 1)—six waist sizes (extra small, small, medium, large, extra large, and extra extra large) in three inseam lengths (short, regular, and long).

Table 1—Sizes, waist measurements (in inches), and inseam lengths (in inches) for the reintroduced women-specific wildland firefighter pants. X—extra, XX—extra extra.

Women-Specific Wildland Firefighter Pant Sizing Chart					
X Small Short	Small Short	Medium Short	Large Short	X Large Short	XX Large Short
Waist: 26–29	Waist: 28–31	Waist: 31–34	Waist: 33–37	Waist: 36–40	Waist: 40–44
Inseam: 28	Inseam: 28	Inseam: 28	Inseam: 28	Inseam: 28	Inseam: 28
X Small Regular	Small Regular	Medium Regular	Large Regular	X Large Regular	XX Large Regular
Waist: 26–29	Waist: 28–31	Waist: 31–34	Waist: 33–37	Waist: 36–40	Waist: 40–44
Inseam: 31	Inseam: 31	Inseam: 31	Inseam: 31	Inseam: 31	Inseam: 31
X Small Long	Small Long	Medium Long	Large Long	X Large Long	XX Large Long
Waist: 26–29	Waist: 28–31	Waist: 31–34	Waist: 33–37	Waist: 36–40	Waist: 40–44
Inseam: 34	Inseam: 34	Inseam: 34	Inseam: 34	Inseam: 34	Inseam: 34

## Availability

It is anticipated that the women-specific wildland firefighter pants will be available through DLA in 2022.

The NISC system may introduce the women-specific pants style for incident replacement purposes.

## About the Author

**Tony Petrilli** (retired) was an equipment specialist for the Fire and Aviation Management Program at the U.S. Department of Agriculture, Forest Service, National Technology and Development Program (NTDP) in Missoula. He holds a bachelor's degree in education from Western Montana College. Tony began working for the Forest Service in 1982 as a firefighter for the Helena-Lewis and Clark and the Beaverhead National Forests. He became a smokejumper in Missoula for the Northern Region in 1989. In 1992, Tony began working wintertime details at NTDP, and he then joined the program full time in 2000. He has been the fire shelter and firefighter clothing project leader since 2005. Tony has served on more than 40 fire entrapment safety review or investigation teams as a personal protective equipment specialist and maintains fire qualifications as a safety officer, division/group supervisor and type 3 incident commander. Tony retired from the Forest Service in May 2021.

## About NTDP

The U.S. Department of Agriculture, Forest Service, National Technology and Development Program, provides Forest Service employees and partners with practical, science-based solutions to resource management challenges. We evaluate, design, and develop new technologies, products, and systems to solve problems and deliver solutions.

## Library Card

**Petrilli, T. 2022.** Women's Firefighter Pants Reintroduced. 2151-2316P-NTDP. Tech. Tip. Missoula, MT: U.S. Department of Agriculture, Forest Service, National Technology and Development Program. 7 p.

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**Keywords:** fire, fire fighting, firefighting, flame-resistant, Nomex, personal protective equipment, PPE, wear testing, women-specific pants, work safety

## Contact Information

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