UNCLASSIFIED

Hearing Protector Fit Testing

Hearing Center of Excellence (HCE)
Defense Health Agency (DHA)

DISCLAIMER

- This information is provided for education purposes only. Reference to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply endorsement by the Department of Defense (DoD), DHA, or the HCE.

INTRODUCTION

- Significant updates to the Department of Defense Instruction (DoDI) 6055.12 “Hearing Conservation Program” were published and effective 22 November, 2023
- A significant change is a new requirement for initial hearing protector (HP) fit testing to be conducted for all DoD personnel who have documented noise exposure greater than or equal to 95 dBA 8-hour time-weighted average (TWA) and who are enrolled in a service hearing conservation program (HCP)

WHO WILL RECEIVE FIT TESTING AND WHEN?

- All DoD personnel enrolled in their service HCP and exposed at or above 95 dBA 8-hour TWA will have a hearing protector fit test at the initial reference audiogram or prior to initial duty in hazardous noise areas or as soon as possible after employment begins
- When a positive Significant Threshold Shift (STS) is identified on the periodic audiogram — a hearing protector fit test will be used to evaluate the hearing protection devices, confirm adequacy of fit, and PAR for the noise environment
- When physical changes to a person's ear canal cause poor fit of assigned hearing protection devices

WHO WILL RECEIVE FIT TESTING AND WHEN?

- When the primary type of fitted hearing protection device is no longer available (e.g., employee switches from earplugs to earmuffs)
- When a single frequency 15 dB shift at 1000, 2000, 3000, and 4000 Hz occurs
- *Note: These are the minimum requirements for hearing protector fit testing in the DoD—services may institute more stringent requirements for hearing protector fit testing to better meet the needs of their respective HCP

WHAT IS HP FIT TESTING?

- HP fit testing is a procedure used to quantitively measure the amount of noise reduction a specific hearing protector is providing a user
- HP fit testing measures the personal attenuation rating (PAR) specific to each individual ear and hearing protector
- The PAR is a single number, real-world measurement of the overall attenuation the hearing protector provides the individual's ear
- PARs reflect what a wearer can achieve and has been shown to achieve, not necessarily what s/he truly achieves on a day-to-day basis

HOW TO USE PAR?

- The PAR is used to determine “individual fit” which is different from determining the “suitability” of a hearing protector’s attenuation based on the noise reduction rating (NRR)
- Even if a hearing protection device is determined to be “suitable” based on the NRR, it may not be a good fit for a particular individual
- The PAR can be used to judge whether a worker is adequately protected by comparing the PAR to the worker’s noise exposure
- The PAR is either subtracted from an A-weighted exposure or compared to a target attenuation value

HOW TO USE PAR?

PAR may be subtracted from an A-weighted noise exposure.

-

16dB*

Personal Attenuation Rating (PAR)

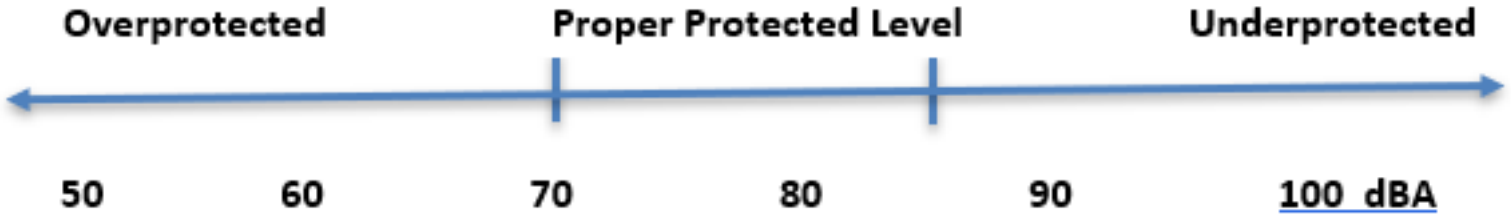
=

80 dBA effective protected SPL at ear

HOW TO USE PAR?

- PAR also provides the ability to fine-tune hearing protection levels to ensure all safety considerations in the workplace are addressed
- When the fit of the hearing protector doesn't provide enough noise reduction, workers may be at risk because they are underprotected
- When workers are unable to hear critical sounds or feel isolated from their environment, they may be "overprotected."
- Protected exposure level (i.e., exposure level - PAR)
- Aim for protected exposures that are between about 70 – 85 dBA
- Protected exposures lower than 70 dBA may risk overprotection

HOW TO USE PAR?



[Protected Exposure Level]

Below 70 dBA	70-85 dBA	Above 85 dBA
Too Quiet	Just Right	Too Loud

HOW TO USE PAR?

- With a PAR, supervisors can know if their employees know how to adequately insert hearing protection
- While the same PAR is not guaranteed at each insertion, a recorded PAR does establish training and the adequacy of the fit

METHODS

- 3 fit-testing measurement methods
  - Microphone in real-ear (“MIRE”)
  - Real-ear at threshold (“REAT”)
  - Loudness balance

METHODS - MIRE

- Objective, physical test method
  - MIRE: uses dual-microphone to measure the sound pressure level of a test signal inside and outside a hearing protector
  - Fast
  - No participant response required
  - Currently can only test certain hearing protectors (brand-specific)
  - Requires modified protectors (uses surrogate hearing protectors)

METHODS - REAT

- Subjective test method
  - REAT: threshold-based
  - Psychophysical task to compare results with and without earplugs to determine attenuation
  - Requires participant response, ambient noise consideration

METHODS – Loudness Balance

- Subjective test method
  - Intensity-matching task: Participant to match loudness of signals in one ear to the other
  - Psychophysical task to compare results with and without earplugs to determine attenuation
  - Requires participant response
  - Threshold ceiling effects

CHARACTERISTICS

FAES characteristics				
System	Test Method	Applicable Hearing Protectors	Estimating Exposure	Participant Response Required
Benson Medical CCF-200 Fit Test™	REAT under headphones	Any earplug	Subtract from dB(A)	Yes
Honeywell VeriPRO™	Loudness Balance under headphones	Any earplug	Subtract from dB(A)	Yes
FitCheck Solo™	REAT under headphones	Any earplug	Subtract from dB(A)	Yes
Workplace Integra™	REAT under headphones	Any earplug	Subtract from dB(A)	Yes
3M EARFit™ Validation System	MIRE	Only 3M earplugs and earmuffs	Subtract from dB(A)	No
Phonak SafetyMeter™	MIRE	Only Phonak Serenity custom earplugs	Subtract from dB(C)	No
Edare Audhere™	REAT under headphones	Any earplug	Subtract from dB(A)	Yes

SYSTEMS - MIRE

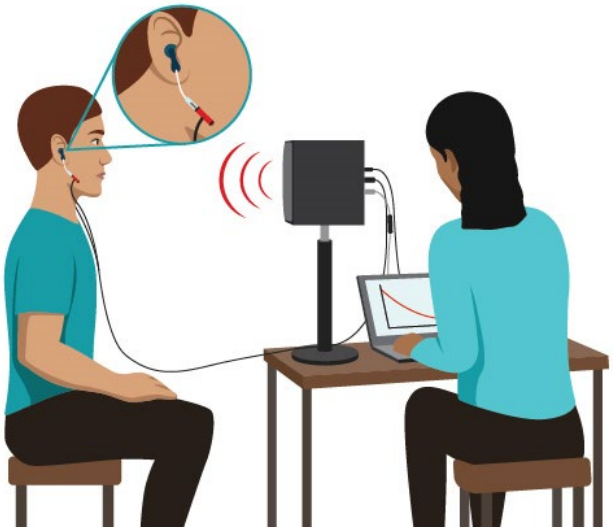


photo credit: NIOSH

3M E-A-Rfit™

Phonak Safety Meter™

source: https://www.3m.com/3M/en_US/hearing-protection-us/products/e-a-rfit-validation-system/
source: https://www.phonak-communications.com/en/products/serenity/safetymeter

SYSTEMS - REAT

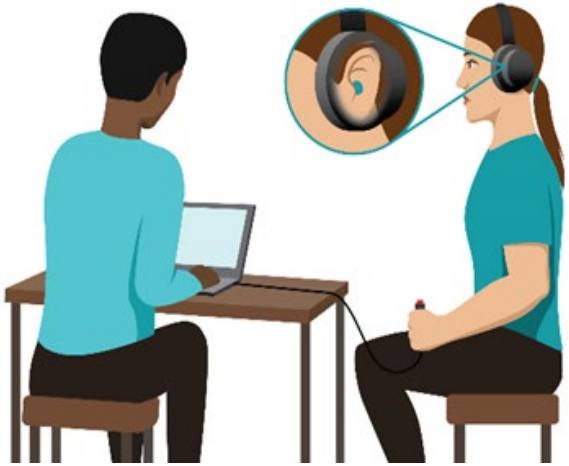


photo credit: NIOSH

Fit-Check Solo™

source: http://www.moldex.com/pdf/datasheets/fitchecksolo.pdf

Benson Medical CCF-200™

source: https://www.bensonmedical.com/ccf200

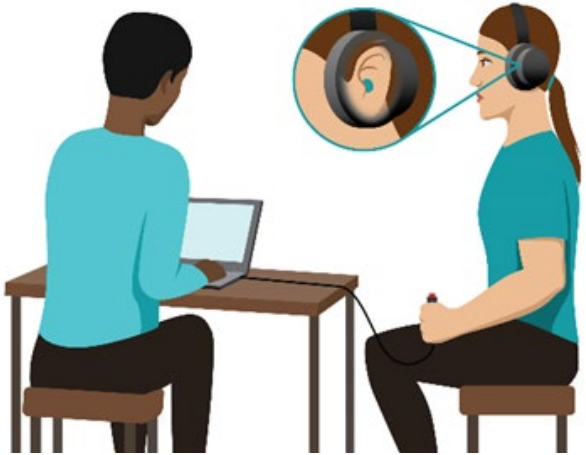
SYSTEMS - REAT

photo credit: NIOSH

Edare Audhere™

source: https://wahtshearing.com/

SYSTEMS - REAT



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Integrafit™

source: http://www.workplaceintegra.com/integrafit/index.php;
https://www.workplaceintegra.com/blog/ready-to-fit-test-hearing-protection/

SYSTEMS – LOUDNESS BALANCE

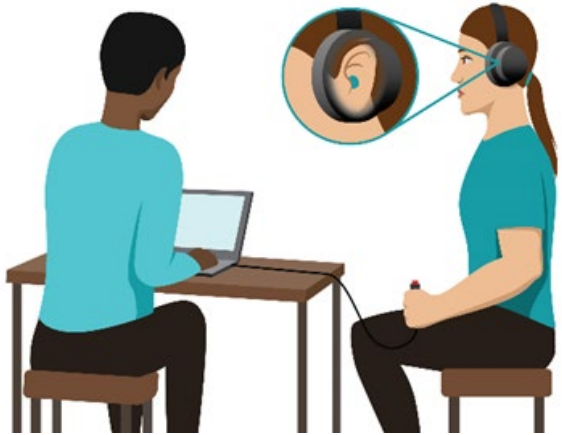


photo credit: NIOSH

Honeywell VeriPRO™

source:https://www.honeywellsafety.com/Products/Hearing/Hearing_Protection/VeriPRO_Earplug_Fit_Testing.aspx?site=/au# ; https://safety.honeywell.com/en-us/products/by-brand/howard-leight/veripro

WHY SHOULD HP FIT TESTING BE CONDUCTED?

- Identify workers at risk for noise-induced hearing loss due to inadequate hearing protector fit
- Properly select worker's hearing protectors to meet individual and environmental needs
- "Train-the-trainer" to better match hearing protectors to meet individual worker needs
- Train workers to properly fit and use hearing protectors
- Increase self-efficacy among workers who must wear hearing protectors

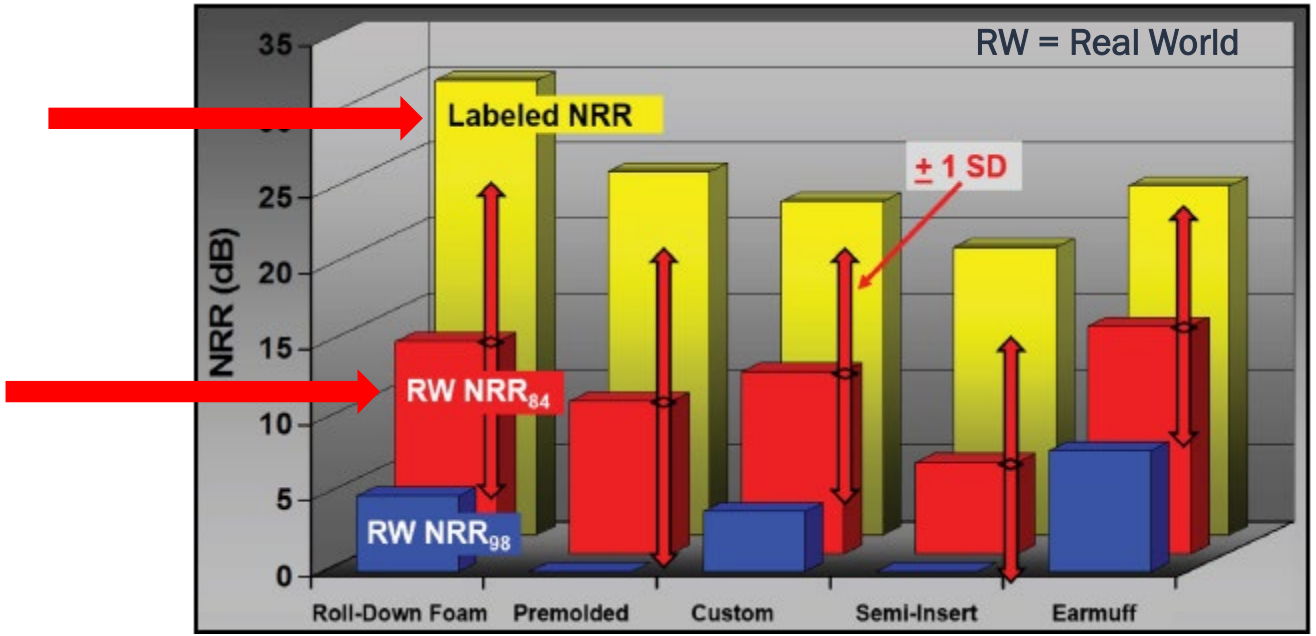
WHY SHOULD HP FIT TESTING BE CONDUCTED?

- Improve training outcomes by providing real-time feedback and documentation
- Motivate workers to consistently use hearing protectors in noisy environments
- Optimize maintenance of hearing protector inventories; potentially reduce costs

WHY SHOULD HP FIT TESTING BE CONDUCTED?

- Comply with DoDI 6055.12 and OSHA policy requirements for fitting hearing protectors, providing training, and maintaining records
- Evaluate hearing conservation program effectiveness
- Reduce noise-induced hearing loss for those enrolled in HCPs

WHY SHOULD HP FIT TESTING BE CONDUCTED?



Berger, AIHA Noise Manual, 6th Edition, 2022

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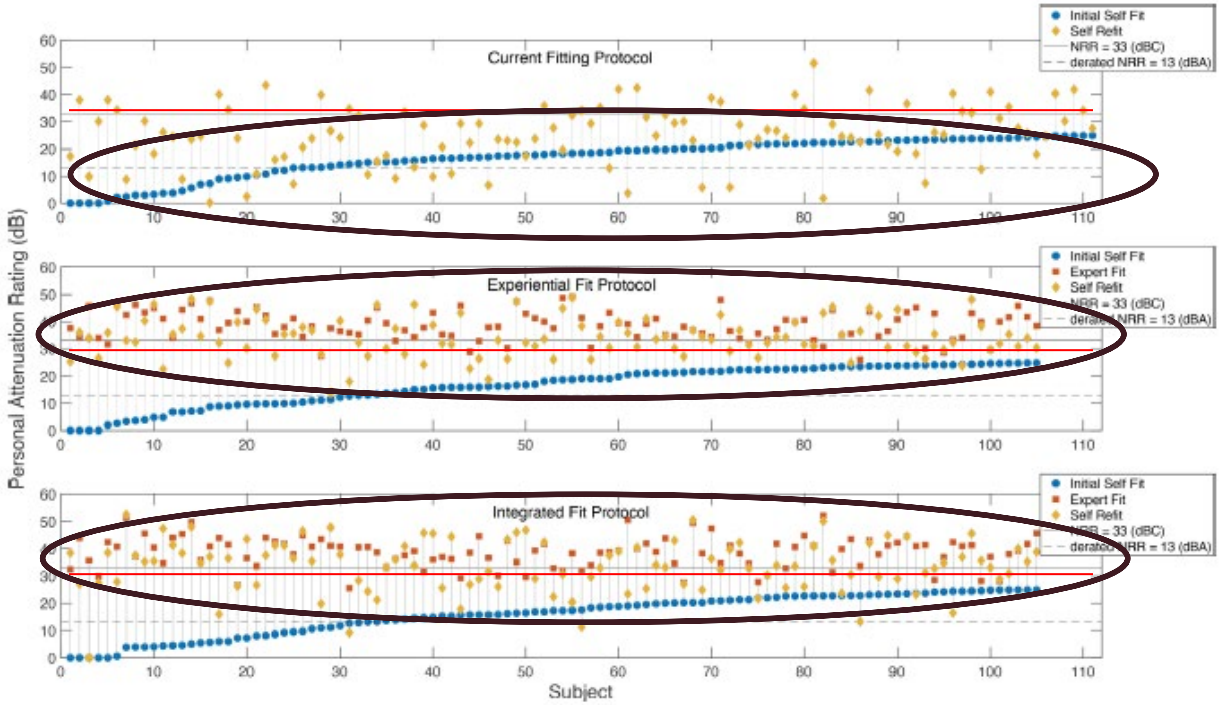

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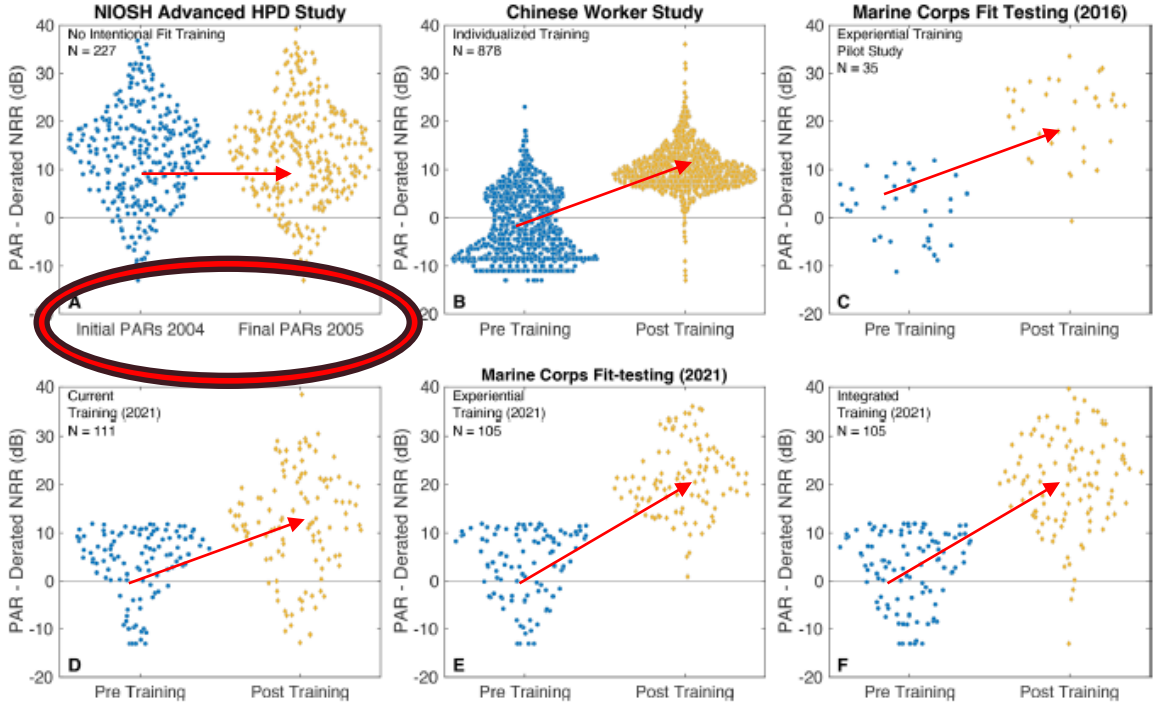

WHY SHOULD HP FIT TESTING BE CONDUCTED?

- Cost benefit associated with positive hearing outcomes
  - Sayler et al. (2018)
    - ✓ 14 metal manufacturing facilities (8,578 workers)
    - ✓ Fit testing significant predictor of lower STS rates (p = 0.001)
    - ✓ Fit testing plus higher training cost associated with decreased hearing impairment rate (p = 0.01)
    - ✓ Training that included fit testing associated with lower 10-year average of high-frequency (3kHz, 4kHz, 6kHz) hearing loss rates (p = 0.03).

NEXT STEPS

- Implementation processes will be determined by each service
  - Equipment procurement
  - Personnel training to conduct fit testing
  - Identification of who needs to be fit tested, when to test, and where to test them
  - Develop testing process/flow for identified personnel
  - Establish documentation/record keeping processes (DD3126)

DOD REGULATIONS

- DoD Hearing Conservation Program
  - DoDI 6055.12 (14 AUG 2019). 3.6.1(2)(a). "…individual fit testing is recommended as best practice when possible)"
  - DoDI 6055.12 (proposed 2023). "Provide initial hearing protector fit testing for all DoD personnel who have documented noise exposure greater than or equal to 95 dBA 8-hour time-weighed average (TWA) and who are enrolled in a service hearing conservation program…"
- Army Hearing Program
  - DA PAM 40-501 (8 JAN 2015). Section 7-15. "…Recommended best practices for fit testing would be the use of fit testing equipment which can establish an objective personal attenuation rating for the individual with hearing protection inserted."

DOD REGULATIONS

- Marine Corps
  - MCO 6260.3A (26 SEP 2016) Section 3.c. “It is recommended that activities and units, in consultation with supporting MTF occupational audiologist, consider new technology to fit test hearing protectors. Like respiratory fit testing, this indicates that maximum protection can only be obtained if the ideal fit is achieved; various commercial off-the-shelf products assist in achieving optimal fit through hearing protector selection and employee training. Such products generate a personal attenuation rating (PAR) that indicates a worker’s noise reduction levels for a given fitting and hearing protector.”

- Navy and Marine Corps
  - NMCPHC TM-6260.51.99-3 Section IV.B. “Field attenuation estimation systems, commonly referred to as a fit-test system are recommended as a best practice. Field attenuation estimation using the fit-test system should be performed by a trained safety professional or industrial hygienist per reference (d), or by an occupational audiologist.”

DOD REGULATIONS

- DoD Design Criteria Standard for Noise Limits
  - MIL-STD-1474E (15 APR 2015). 4.2.1.2. Personal protective equipment. "…Fit testing of the hearing protection device should be performed, where feasible."
- MAAWS Training Manual
  - "Within 3 months prior to firing the M3/M3E1 MAAWS, trained Medical Staff at Home Station must confirm by Fit Check testing Soldiers can achieve a 29 dB Personal Attenuation Rating (PAR)."

BEST PRACTICE

- Occupational Safety and Health Administration (OSHA)/National Institute for Occupational Safety & Health (NIOSH)/National Hearing Conservation Association (NHCA) Alliance
  - Best Practice Bulletin (2008): Research studies have suggested that when individuals are involved in the fitting process and receive positive feedback on the proper fit of their earplug, they will be more likely to have a positive attitude about protecting their hearing and will be more apt to use hearing protection correctly and consistently in the workplace. This positive outcome should result in reducing noise-induced hearing loss in the workplace.
- Council for Accreditation in Occupational Hearing Conservation (CAOHC) Hearing Conservation Manual, 5th Ed (2014, 2nd printing 2017)
  - Defines fit testing as “The most accurate procedure(s) for checking the fit of an earplug by measuring real-world attenuation.”

DHA HEARING CENTER OF EXCELLENCE CONTACT

- Theresa Schulz, PhD
- https://hearing.health.mil/hcehome/Contact-Us

RESOURCES

- *Best practice bulletin: Hearing protection-Emerging Trends: Individual Fit Testing* (2008, May 13). Retrieved July 8, 2022, from http://www.hearingconservation.org/assets/docs/AllianceRecommendationForFitTesting_Final.pdf

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