



UNITED STATES MARINE CORPS
MARINE CORPS DEVELOPMENT AND EDUCATION COMMAND
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IN REPLY REFER TO

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From: Commanding General, Marine Corps Development and
Education Command
To: Commandant of the Marine Corps (LME-4)
Subj: REPORT OF FLEET MARINE FORCE OPERATIONAL TEST OF ISO
CONTAINER CONNECTORS
Ref: (a) MCESS/Container ACG mtg of 11 Mar 87
Encl: (1) ISO Container Test Report

1. The test of ISO container connectors directed during the reference has been conducted. The results are reported in the enclosure.

2. Although the operational test was brief, the results were considered sufficiently clear to indicate that the Tandemloc is preferred to the other connectors. Results noted during this brief operational test, coupled with the results of laboratory testing by the Naval Civil Engineering Laboratory, reaffirm the initial acquisition decision concerning the use of Tandemloc connectors as the standard for the Field Logistics System.

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By direction

ISO CONNECTOR
TEST REPORT

1. BACKGROUND. During February 1987, five commercially available ISO corner fitting connectors were tested by the Naval Civil Engineering Laboratory (NCEL) for use throughout the Marine Corps Field Logistics System. The Draft Technical Report dated 25 February 1987 contains details concerning the results of the laboratory testing. It provided a ranking of the five connectors based upon the test results and interpretation of those results by a committee of NCEL engineers. The draft report recommended that before a final decision was reached the Marine Corps should conduct a brief operational evaluation by potential users. On 11 March 1987 the MCESS/Shelter Acquisition Coordinating Group (ACG) accepted the favorable recommendations concerning the top three connectors from the NCEL report and directed that the Development Project Officer coordinate with the Fleet Marine Force to conduct an expeditious evaluation of the three candidates remaining. The evaluation was conducted at First FSSG, Camp Pendleton, CA. during the period 8-10 April 1987.

2. TEST PROCEDURE. The evaluation required that Marines actually attempt to use the connectors with the Quadruple Container (QUADCON). Several connecting and disconnecting of QUADCON's utilizing connectors provided by Blair, Peck and Hale, and Tandemloc were conducted by a group of FSSG Marines. The group contained a Captain, MOS 3002, and four enlisted Marines, Private through Corporal, MOS 3051. A 10,000 lb TEREX forklift with driver was used to move the QUADCON's. Attempts were made to connect/disconnect both on a level asphalt surface, and on uneven, sandy terrain.

3. TEST RESULTS

a. GENERAL. Initial attempts to install the connectors into the ISO corner fittings revealed that two of the connectors would not fit into the QUADCON's ISO corner fitting. One ISO fitting would not accept the Peck and Hale, but would accept Blair and Tandemloc. Its marking was as follows:

DI
9747
D

Another fitting would not accept Blair connectors, but would accept Peck and Hale and Tandemloc. It was marked as follows:

CYS
TL
8510
NL

It was apparent that these two models of ISO corner fittings

contained holes that were of different sizes (diameter and height) thus affecting how the connectors would fit.

b. BLAIR CONNECTORS. The Blair connector is a loose fitting connector which gives the novice an uneasy feeling about whether or not it is properly installed. It would come out of the corner fitting if it was twisted by hand when in the load position. In the lock position, difficulty was encountered in removing the fitting. As containers were being connected or disconnected, the toggle/arm of the connector would not move freely on several occasions. Marines resorted to using force by taking another connector and banging on the arm to get it to move to the desired location. One connector arm broke off when a Marine tapped it lightly. The arm on other connector was bent, apparently as a result of shipment, but functioned properly. The recessed area for movement of the arm can become a catchment for foreign material (dirt, sand, etc.), especially since it is heavily greased.

c. PECK AND HALE. This connector has pointed ends which make it quicker and easier to connect to a corner fitting. It fits tighter than Blair when in the load position and could not be removed. The arm moved more freely than Blair and required less tapping, but occasionally required some forcing when containers were being disconnected. The recessed area for the arm is 180 degrees, as compared to Blair's 90 degrees, thereby presenting less of a problem as a catchment for foreign material. Grease was not required.

d. TANDEMLOC. This connector has pointed ends and provided the tightest fit in the load position of any connector evaluated. It requires use of a socket wrench to install, but a speed wrench could be used. This connector requires more time to install than the other two connectors. However, its design allows Marines to keep their hands out of crush danger areas, the others do not.

4. ANALYSIS. In order of significance, factors to consider are as follows:

a. SAFETY. When the Marines were attempting to install or remove the connectors it was noted that they would put their hands in crush danger almost every time they used the Blair and Peck and Hale connectors. This is not a problem with Tandemloc.

b. SIZE/FIT. The ISO corner fittings on the QUADCON'S were of different sizes and would not universally accept both Blair and Peck and Hale. In terms of tightness of fit when in the locked position, although all three are technically safe, the perception of looseness, especially of Blair connectors, makes the Tandemloc seem to be a better fit to the user. Note: The effects of extended field use of QUADCON'S and fittings are unknown. It is opined that a loose fit to start will only be

aggravated by wear and tear in the field.

c. TOOLS REQUIRED. Although neither the Blair nor the Peck and Hale require tools for installation and removal, in practical use Marines had to use connectors as hammers to dislodge other connectors. The Tandemloc requires use of a socket wrench but Marines interviewed offered that they would rather use an appropriate tool than makeshift hammers to do the job.

d. USER OPINION. Questionnaires filled out by four Marines showed Tandemloc was their first choice, apparently because of its tighter fit and safety. Two Marines preferred Peck and Hale, but only if it could fit in all corner fittings in all circumstances.

e. REMOVAL OF DAMAGED CONNECTOR. The Blair connector that broke was in the locked position and it was very difficult to remove after being broken. Marines had to place their hands in crush danger while hand turning the connector while a forklift moved the container slightly. The Tandemloc connector design is such that it can be taken apart by removing two bolts. If it jams it is easy to remove.

5. CONCLUSION. It is apparent that Marines of varying skill levels and different MOS's will be involved in connecting and disconnecting containers and shelters of the Field Logistics System. Many of these containers weigh up to 10,000 lbs. The issue of safety is paramount. Accordingly, the Tandemloc connector, which allows Marines to work outside the hand crush area and does not require use of makeshift hammers is considered to be the safest and the best choice.

6. RECOMMENDATION. That the Tandemloc be procured as the standard ISO connector for the Field Logistics System.

7. RELATED ISSUES. During this brief Operational Test, the following items were noted. Although not material to the recommendation in this test they do point to a necessity for training in the proper handling of containers.

a. FMF personnel expressed concern over the availability of material handling equipment and trucks to move and transport QUADCON'S in connected configurations. It was suggested that since the MHE to move connected containers is not yet generally available, the initial quantities of connectors be placed in PWRMS, training allowance pools, or special allowances because of their limited potential for immediate use.

b. Connecting QUADCON's at their corner fittings on hard level surfaces requires patience and precision operation of MHE. On uneven terrain extreme difficulties in aligning the containers will be encountered. During this evaluation connecting and

disconnecting containers on unprepared surfaces took over 4 times as long as on prepared surfaces. The speed and safety of connecting and disconnecting is materially effected by two human factors; the skill of the MHE operator, and the degree of teamwork between the individuals installing/removing connectors and the MHE operator. Training will be necessary to insure an adequate level of safety and skill no matter what connector is utilized.

c. The difficulty in aligning two containers for installation or removal of connectors may be further aggravated as containers are subjected to constant use. Bending, twisting or other dimension distortion to containers caused by lifting, slinging or other means of movement may make it almost impossible to properly align the containers for use with any connector. Training will be necessary to ensure that all personnel involved with the movement of containers are aware of the proper ways to lift them without causing dimensional distortion.

d. The TEREX 10,000lb forklift tines get tangled in the metal bands that are under the QUADCON and bend them easily. When lifting through the narrow dimension, the forklift tines protrude and can easily damage another QUADCON as they are being moved adjacent to one another. Training will be necessary to preclude damage to containers.