



U.S. Department
of Transportation
**Federal Highway
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

JAN 17 1995

Refer to: HNG-14

Mr. David E. Wasserstrom
President
Safety Barrier Systems
77 East Market Street
Wilkes-Barre, Pennsylvania 18701

Dear Mr. Wasserstrom:

Your January 4 letter to Mr. William A. Weseman requested the Federal Highway Administration to review test data on your Guardrail Safety Barrier to determine its acceptability for use as a temporary longitudinal barrier on highway projects on the National Highway System.

Individual barrier segments are 1830-mm long by 1070-mm high low-density polyethylene water-filled containers. An exterior steel (ASTM A-36) frame, consisting of 7.9 mm by 76.2 mm straps, 50.8 mm schedule 40 pipes and 6.4 mm cables, is mounted on each segment. Connections between adjacent segments are made with 9.5 mm x 44.5 mm x 203 mm bars welded to the inside of the pipes on one end and slotted on the other for a bolted connection. The test installation consisted of 33 such segments for a total barrier length of 60.4 m. A schematic drawing and material specifications for the Guardian are enclosed.

The Guardian was evaluated as a test level 2 (TL-2) barrier in conformance with the National Cooperative Highway Research Program Report 350, as summarized below.

Test Number	<u>270687-YEW 4</u>	<u>270687-YEW 5</u>
Vehicle Mass (kg)	2000	820
Impact Speed (km/h)	71.5	70.6
Impact Angle (degrees)	25.8	20.3
Occupant Impact Velocity (m/s)		
Longitudinal/Lateral	60/-3.4	3.4/-3/7
Ridedown Acceleration (g's)		
Longitudinal/Lateral	-4.47/3.85	-10.01/6.48
Barrier Deflection (m)	1.98	0.60

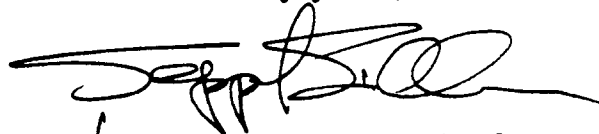
Based on the above results and the post-crash vehicle trajectories, we concur that the Guardian barrier satisfactorily meets the criteria for a TL-2 traffic barrier and find it acceptable for use on Federal projects when requested by a State highway agency.

Since the Guardian system was evaluated at TL-2, it is appropriate for use at locations where impact speeds and angles are not expected to exceed test conditions. However, the crash tests indicate that the Guardian may have capacity beyond test level 2 based on the stable redirection of the both vehicles at the 70 km/h impact speeds, relatively slight deflection of the barrier, and low occupant impact velocities and ridedown acceleration. Accordingly, you may wish to test this barrier to TL-3. You may also wish to identify an appropriate end treatment for the Guardian. At present, the Guardian would need to be flared an appropriate distance from approaching traffic or be shielded with a conventional work zone crash cushion.

Because the Guardian is a proprietary product, its use on Federal projects is governed by the provisions of Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed. Please call Mr. Richard Powers of my staff at (202) 366-1320 if you have any questions concerning these requirements.

By copy of this letter, we are informing our field offices of this action.

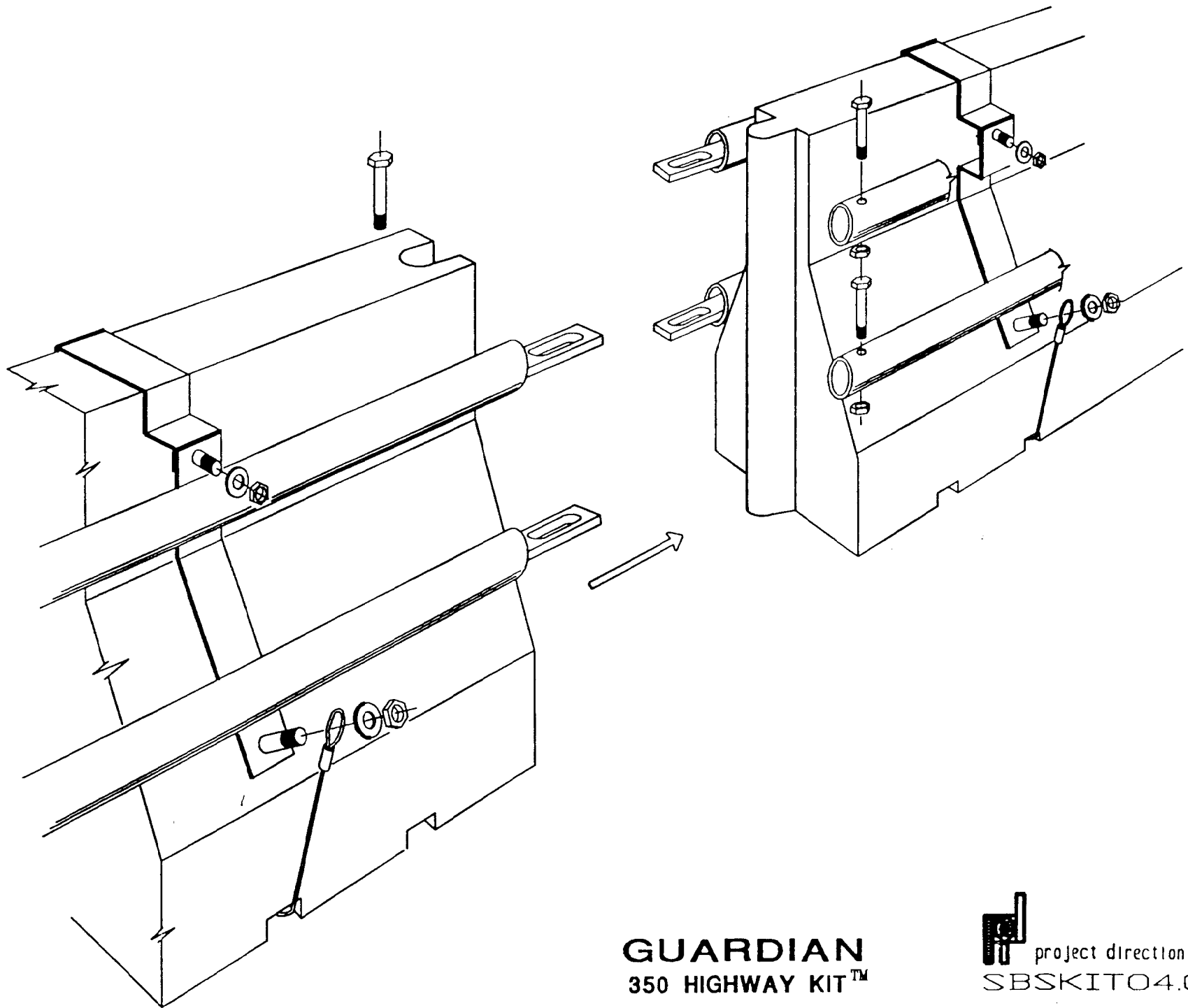
Sincerely yours,



Jerry L. Poston, Chief
Federal-Aid and Design Division

2 Enclosures

Geometric and Roadside Design Acceptance Letter No. B-30



GUARDIAN
350 HIGHWAY KIT™

 project direction inc.
SBSKIT04.GCD

SPECIFICATIONS OF THE
GUARDIAN™ BARRIER
A RECYCLABLE, PORTABLE PLASTIC BARRIER

INTENT: It is the intent of this specification to describe a lightweight portable plastic Barrier. The intended use of the GUARDIAN™ Barrier is to prevent vehicular penetration of a work zone, traffic channelization, pedestrian control, security barriers, erosion control, street and road closures and blockading, race track safety barriers, etc.

SCOPE: This specification recognizes the need for a lightweight and portable barrier to perform some of the functions of cement barriers, rubber cones and barrels and other such devices used to control, direct, channel, and stop vehicular and pedestrian traffic for purposes of containment and/or safety.

CONSTRUCTION: The barrier is made using the rotational molding method to insure watertightness integrity. It is 42 inches in height with a base width of 24 inches. The usable, un-nested length is 72 inches with an additional 6 inch protrusion on one end to form the male connection. Opposite the male end is a 6 inch intrusion of the same shape to accept the male protrusion to form a continuous wall connection. The barrier has, in the center, a filling hole which is 4 1/2 inches in diameter. The sides of the barrier have two sloping surfaces, the topmost being nearly vertical and the lower surface being approximately 25 degrees from vertical. The lower sloping surface will terminate at the top of an 8 inch vertical rise. On the bottom of the barrier are two 6 inch wide forklift slots. All corners in all areas of the barrier shall have no less than a 1 inch radius. A drainage hole and plug on the lower area is placed within a drainage slot in such a fashion as to be readily accessible. The barrier shall have the appearance of a precast concrete barrier.

MATERIAL: The material used is a recyclable low density polyethylene. It is rotationally molded to a thickness of 8 millimeters and is uniform in thickness.

ULTRAVIOLET LIGHT: An ultraviolet light inhibitor is introduced into the raw material mix so as to provide sufficient protection to insure reasonable life of the product in outside weather conditions.

COLORS: The standard colors of the barriers are opaque ivory, international yellow and safety orange. Other colors may be introduced from time to time, however they must conform to state and federal specification on uniform color coding and/or military specifications, or as specifically requested by the customer.

BAFFLES: There are a plurality of baffles molded into the bottom of each barrier and extending upwardly inside the barrier for a distance of 14 inches. The baffles are a necessary part of the structural integrity of the barrier. The baffles shall make intimate contact with the exterior corrugations along each side of the barrier.

GUSSETS: The barriers shall have gussets (or corrugations) molded in each side that will begin at the top of the vertical rise in the base of the side. These gussets will coincide with the edges of each baffle to form a uniform, side-to-side monolith.

WEIGHT: The weight of the barrier shall not exceed 135 lbs. empty. The barrier accepts up to 1655 lbs of liquid or solid ballast while retaining its shape and structural integrity.

SPECIFICATIONS OF THE 350 HIGHWAY KIT™

A MOUNTED, STEEL FRAME ASSEMBLY

INTENT: This specification describes the "350 HIGHWAY KIT"™, a fabricated steel assembly designed to easily mount to the GUARDIAN™ water filled safety barriers. This "KIT" provides two distinct functions: 1. Providing a strong and resilient outer surface to resist the wheel and bumper of a striking vehicle, and 2. To link the barriers to each other and create a very robust linear system such that the force of a striking vehicle will be distributed over many barriers, minimizing the lateral movement at the point of impact.

SCOPE: The "350 HIGHWAY KIT" extends the functionality of the standard GUARDIAN™ Barriers to include installations described by the NCHRP Report 350 as a work-zone safety device for highway construction projects.

CONSTRUCTION: The structural design consists of 6 elements. Two "inverted U" saddles formed from 5/16" x 3" flat bar are placed over the top of each barrier. The saddles create an offset mounting point for the side panels, such that the upper longitudinal pipe is 5" from the vertical face of the barrier. The two fabricated pipe assemblies each consist of two formed flat bars with two 72" long, 2" diameter steel pipes welded across at specific elevations. These pipe assemblies are then "hung" onto 5/8" diameter bolts protruding from the offset saddle plates. Flat washers and hex nuts secure this connection. The lower pipe is effectively in line with the lower vertical barrier face, and with the offset mounting of the upper pipe, the two pipes are horizontally aligned.

MATERIALS: The formed "saddles" and the formed vertical plates of the side panels are 5/16" x 3" Hot Rolled Steel, ASTM A-36 "merchant quality". The connection "tongues" are made from 1/2" x 2" Schedule 40 (ASTM A120). The connection cables are permanently assembled from 3/16" diameter 7 x 19 strand full compliance galvanized aircraft cable, vinyl coated, with galvanized thimbles and plated compression sleeves.

INSTALLATION: The assembled side panels support the upper and lower pipes at elevations of 15" and 31" above the ground. The area between the lower and upper pipes creates an effective "trap zone" for the bumper of a striking vehicle, and prevents the vehicle from "climbing" up over a barrier. A pair of steel cable assemblies are secured to 4 - 5/8" bolts protruding at the bottom of the side panel flat bars. The cables extend under the barrier within a molded clearance groove and complete the connection around each barrier, preventing the system from lifting upon impact from a vehicle.

Each barrier "KIT" is connected to the next in line by means of 4 male-female connector lugs, each utilizing a 1/2" flat bar, welded to the inside of the longitudinal pipe ends. Each flat bar lug has a 2" long slot to receive a 5/8" diameter grade 5 linking bolt, dropped through an 11/16" diameter vertical hole in the receiving pipe end. This slot arrangement allows for some flexibility in the connection, particularly when the barrier line must follow a curve or elevation change in the road surface.

se materials occur in the
ted States.

2) The State has standard contract
visions that require the use of do-
stic materials and products, includ-
steel materials, to the same or
ater extent as the provisions set
th in this section.

3) The State elects to include alter-
e bid provisions for foreign and do-
stic steel materials which comply
h the following requirements. Any
cedure for obtaining alternate bids
ed on furnishing foreign steel ma-
ials which is acceptable to the Divi-
n Administrator may be used. The
tract provisions must (1) require all
ders to submit a bid based on fur-
hing domestic steel materials, and
clearly state that the contract will
awarded to the bidder who submits
lowest total bid based on furnish-
domestic steel materials unless
h total bid exceeds the lowest total
l based on furnishing foreign steel
aterials by more than 25 percent.

4) When steel materials are used in
project, the requirements of this sec-
n do not prevent a minimal use of
eign steel materials, if the cost of
ch materials used does not exceed
e-tenth of one percent (0.1 percent)
the total contract cost or \$2,500,
ichever is greater. For purposes of
is paragraph, the cost is that shown
be the value of the steel products as
ey are delivered to the project.

(c)(1) A State may request a waiver
the provisions of this section if;

(i) The application of those provi-
ns would be inconsistent with the
blic interest; or

(ii) Steel materials/products are not
duced in the United States in suffi-
ent and reasonably available quanti-
s which are of a satisfactory quality.

(2) A request for waiver, accompa-
ed by supporting information, must
submitted in writing to the Region-
Federal Highway Administrator
(FHWA) through the FHWA Divi-
n Administrator. A request must be
mitted sufficiently in advance of
ie need for the waiver in order to
low time for proper review and
tion on the request. The RFHWA
ll have approval authority on the re-
est.

(3) Requests for waivers may be
made for specific projects, or for cer-
tain materials or products in specific
geographic areas, or for combinations
of both, depending on the circum-
stances.

(4) The denial of the request by the
RFHWA may be appealed by the
State to the Federal Highway Admin-
istrator (Administrator), whose action
on the request shall be considered ad-
ministratively final.

(5) A request for a waiver which in-
volves nationwide public interest or
availability issues or more than one
FHWA region may be submitted by
the RFHWA to the Administrator for
action.

(6) A request for waiver and an
appeal from a denial of a request must
include facts and justification to sup-
port the granting of the waiver. The
FHWA response to a request or appeal
will be in writing and made available
to the public upon request. Any re-
quest for a nationwide waiver and
FHWA's action on such a request may
be published in the FEDERAL REGISTER
for public comment.

(7) In determining whether the waiv-
ers described in paragraph (c)(1) of
this section will be granted, the
FHWA will consider all appropriate
factors including, but not limited to,
cost, administrative burden, and delay
that would be imposed if the provision
were not waived.

(d) Standard State and Federal-aid
contract procedures may be used to
assure compliance with the require-
ments of this section.

(23 U.S.C. 315, sec. 10 of Pub. L. 98-229, 98
Stat. 55, sec. 165 of Pub. L. 97-424, 96 Stat.
2136 and 49 CFR 1.48(b))

[48 FR 53104, Nov. 25, 1983, as amended at
49 FR 18821, May 3, 1984]

§ 635.411 Material or product selection.

(a) Federal funds shall not partici-
pate, directly or indirectly, in payment
for any premium or royalty on any
patented or proprietary material, spec-
ification, or process specifically set
forth in the plans and specifications
for a project, unless:

(1) Such patented or proprietary
item is purchased or obtained through

mpetitive bidding with equally sulta-
e unpatented items; or

(2) The State highway agency certi-
fies either that such patented or pro-
prietary item is essential for synchron-
ization with existing highway facili-
ties, or that no equally suitable alter-
nate exists; or

(3) Such patented or proprietary
item is used for research or for a dis-
tinctive type of construction on rela-
tively short sections of road for exper-
imental purposes.

(b) When there is available for pur-
chase more than one nonpatented,
nonproprietary material, semifinished
or finished article or product that will
fulfill the requirements for an item of
work of a project and these available
materials or products are judged to be
of satisfactory quality and equally ac-
ceptable on the basis of engineering
analysis and the anticipated prices for
the related item(s) of work are esti-
mated to be approximately the same,
the PS&E for the project shall either
contain or include by reference the
specifications for each such material
or product that is considered accepta-
ble for incorporation in the work. If
the State highway agency wishes to
substitute some other acceptable ma-
terial or product for the material or
product designated by the successful
bidder or bid as the lowest alternate,
and such substitution results in an in-
crease in costs, there will not be Feder-
al-aid participation in any increase in
costs.

(c) A State highway agency may re-
quire a specific material or product
when there are other acceptable mate-
rials and products, when such specific
choice is approved by the Division Ad-
ministrator as being in the public in-
terest. When the Division Administra-
tor's approval is not obtained, the item
will be nonparticipating unless bidding
procedures are used that establish the
unit price of each acceptable alterna-
tive. In this case Federal-aid partici-
pation will be based on the lowest price
so established.

(d) Appendix A sets forth the
FHWA requirements regarding (1) the
specification of alternative types of
culvert pipes, and (2) the number and
types of such alternatives which must

be set forth in the specifications for
various types of drainage installations.

(e) Reference in specific plans and
specifications to single trade name materi-
als will not be approved on Federal-aid
contracts.

§ 635.413 Guaranty and warranty clauses.

(a) Except as provided in paragraph
(b) of this section, clauses that require
the contractor to guarantee or war-
rant materials and workmanship or to
otherwise maintain the work for a
specified period after its satisfactory
completion by the contractor and its
final acceptance by the State, will not
be approved for use in Federal-aid con-
tracts. Work performed and materials
replaced under such guaranty or war-
ranty clauses after final acceptance of
work are not eligible for Federal partici-
pation.

(b) Contracts which involve furnish-
ing and/or installing electrical or me-
chanical equipment should generally
include contract clauses that require:

(1) Manufacturer's warranties or
guarantees on all electrical and me-
chanical equipment consistent with
those provided as customary trade
practice, or

(2) Contractors' warranties or guar-
antees providing for satisfactory in-
service operation of the mechanical
and electrical equipment and related
components for a period not to exceed
6 months following project accept-
ance.

§ 635.417 Convict produced materials.

(a) Materials produced by convict
labor may only be incorporated in a
Federal-aid highway construction
project if such materials have been:

(1) Produced by convicts who are on
parole, supervised release, or proba-
tion from a prison or

(2) Produced in a qualified prison fa-
cility and the cumulative annual pro-
duction amount of such materials for
use in Federal-aid highway construc-
tion does not exceed the amount of
such materials produced in such facili-
ty for use in Federal-aid highway con-
struction during the 12-month period
ending July 1, 1987.

(b) *Qualified prison facility* means
any prison facility in which convicts,



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March 10, 1995

400 Seventh St., S.W.
Washington, D.C. 20590

Refer to: HNG-14

Mr. David E. Wasserstrom
President
Safety Barrier Systems
77 East Market Street
Wilkes-Barre, Pennsylvania 18701

Dear Mr. Wasserstrom:

In response to your February 14 letter to Mr. Jerry Poston, please be advised that the conditions under which your Guardian water-filled barrier may be used are essentially the same as those listed in Mr. Poston's September 27, 1994, letter to Mr. J.M. Essex regarding the Triton barrier. These conditions include:

1. In work zones with traffic speeds of 70 km/h or less.
2. In work zones where the barrier is used in lieu of cones or drums.
3. In work zones of short duration where some risk to workers and motorists is acknowledged but considered acceptable.

Although the Federal Highway Administration did not quantify "short duration," we would suggest it be measured in days or weeks, rather than months. If a positive barrier is required for a longer period (and it does not have to be removed and reset daily) the relative stiffness, lower cost, and reserve capacity of standard precast concrete units should make them more cost-effective than a water-filled plastic barrier. As we have previously stated, any use of plastic barriers must be consistent with that barriers performance characteristics, particularly its deflection distance upon impact.

We have noted that you plan to certify the Guardian as a test level 3 barrier this year, and look forward to reviewing the 100 km/h test results when they become available.

Sincerely yours,

Jerry L. Poston, Chief
Federal-Aid and Design Division

Federal Highway Administration
HNG-14:RPowers:gm:3-10-95:366-1320
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Reader, 3128 File, 3128