



**FAMILY OWNED  
SINCE 1890**

Mr. Peter Kivett  
U.S. Dept. of Transportation  
National Highway Traffic Safety Administration  
Office of Defects Investigation (NSA-122)  
Washington, DC 20590

#### PART 573 Defect and Noncompliance Report

Date: 11/4/14

This report serves as Sutphen Corporation's revised notification to the U.S. Department of Transportation, National Highway Traffic Safety Administration that a defect related to the motor vehicle safety exists in certain SPH 100 aerial platforms. Sutphen determined that this defect existed in these vehicles as initially submitted to NHTSA on 8/16/2013.

Manufacturer's identification code: NACIS# 336120

#### I. Manufacturer, Designated Agent, and Chain of Distribution Information

Manufacturer's corporate name: Sutphen Corporation

##### Contact Information:

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#### II. Identification of the Recall Population and Size

Make: Sutphen  
Model: SPH 100  
Model Year(s): 2003 through 2014  
Inclusive Dates of Manufacture: 12/2002 through 10/2014  
Body Style/Type: Aerial Fire Apparatus  
Other Information: Five section telescoping aerial platform  
Total Number of vehicles: 136

Make: Sutphen  
Model: SP 110  
Model Year(s): 2000 through 2004  
Inclusive Dates of Manufacture: 12/1999 through 11/2004  
Body Style/Type: Aerial Fire Apparatus  
Other Information: Five section telescoping aerial platform



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Total Number of vehicles: 15

Make: Sutphen  
Model: SPI 112  
Model Year(s): 2003 through 2011  
Inclusive Dates of Manufacture: 12/2002 through 11/2011  
Body Style/Type: Aerial Fire Apparatus  
Other Information: Five section telescoping aerial platform  
Total Number of vehicles: 2

Make: Sutphen  
Model: SAI 110  
Model Year(s): 2003 through 2011  
of Inclusive Dates Manufacture: 12/2002 through 11/2011  
Body Style/Type: Aerial Fire Apparatus  
Other Information: Five section telescoping aerial water tower  
Total Number of vehicles: 2

Grand Total of Vehicles: 155

Percentage of recall population estimated to contain the defect: 100%

How was the recall population determined?

Based on the nature of the condition, it was determined that all five section aerial ladders would be included. Manufacture dates based on production of all five section aerials.

How is recall population different from similar vehicles not included?

The extend/retract system on the three and four section aerials is of a different design configuration. Also, since the loads and capacities are lower on these models, the resulting stress in the extend/retract components is significantly reduced.

### III. Description of the Defect or Noncompliance and Chronology of Events

Description of the defect:

The main extend cables failed, which resulted in the ladder de-scoping.

Description of the cause(s) of the defect:

On the Green Valley truck, the main cables were excessively worn and in poor condition due to lack of proper maintenance.. The bearings in the sheaves used in the extend/retract system had seized and prevented the sheaves from rotating. This caused the wire rope to slide over the non-moving sheaves which resulted in excessive wear and reduced load carrying capacity. Lack of proper maintenance is also what caused the bearings to fail.

Investigation of the Belle Valley incident revealed that during refurbishment of the truck following significant damage due to exposure at a chemical fire, the main 1-3 cables were replaced by a set of undersized cables resulting in a de-scoping incident.



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Sutphen cannot determine the root cause of the de-scoping incident that occurred on the Hall County Georgia truck because the truck is impounding at the fire department training center. Sutphen has had only had limited access to the truck, once immediately (next day) after the incident and a second review when NHTSA was onsite. On both occasions, we were limited to observation of the aerial sections and wire rope, without the opportunity for disassembly and detailed component inspection/analysis.

Description of the safety consequence(s) of the defect:

Failure of the extend/retract system can result in either the aerial to become inoperable (i.e. will not extend/retract properly) or cause it to unexpectedly retract or de-scope. This movement could result in damage to the vehicle and/or injuries to personnel on or around the vehicle.

Identify warnings that may have preceded the defect:

On the Green Valley truck, the failure of the bearings in the sheaves should have produced a large amount of noise. This noise should have been noticeable enough to cause further inspection. Upon proper inspection, evidence of wear or other nonconformities on the cables and/or sheaves would also have been visible.

Chronological Summary of Events:

Green Valley AZ

8/15/2012 – Notification received of an incident involving a 2009 SPH 100 in Green Valley, AZ

8/16/2012 – Representatives from Sutphen Corporation arrived in Green Valley to inspect the vehicle. Representatives from the Arizona Department of Public Safety were also present.

8/17/2012 – Notification sent to all dealers providing information on the incident.

8/19/2012 – Sutphen personnel reviewed all available documentation and information. Based on preliminary information, lack of maintenance appeared to be the leading cause.

8/21/2012 – Service Bulletin sent to all Sutphen customers informing them of the importance of proper maintenance and inspection. This document also provided contact information if the vehicle owners had questions or needed more information from Sutphen.

9/5/2012 – Additional Sutphen personnel, along with a representative from the company that manufactured the wire rope, went to Green Valley to further examine the vehicle and the damaged components.

9/26/2012 – Sutphen personnel travelled to Green Valley to review the vehicle in question. This meeting included representatives from the different parties involved.

11/12/2012 – Vehicle arrives at Sutphen Corporation (Dublin, OH)

1/28/2013 – Disassembly and further inspection of the vehicle. Following the inspection, the vehicle was repaired and returned to Green Valley.

This incident was unique in that there were no records of a Sutphen platform having previously involved in an occurrence like this one. Everything that was examined led to the conclusion that with proper aerial device maintenance and inspection, this incident would not have occurred.



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#### Belle Valley PA

6/25/14- Notification of de-scope of ladder while repairing an antenna

6/26/14- Sutphen technical personnel onsite to investigate cause of de-scope. As part of the investigation it was determined undersize cables had been erroneously installed by the service facility on the 1 to 3 cable assembly which was the root cause of the de-scope

7/2/14- Truck was returned to the factory for further assessment and repairs.

9/9/14- A completely new structural assembly with all new engineering changes and components were installed on the new ladder structure. New ladder assembly installed on Customer's chassis

9/29/14- Initial customer inspection and review of updated components which received a positive response

10/5/14- Customer issue list and requested additional components were installed as a result of previous customer inspection.

10/17/14- Final testing including Third Party inspection completed

10/30/14- Customer final inspection including operational testing completed by the customer and truck was accepted.

10/31/14- Delivery engineer returned the truck to the fire department

11/1/14- Delivery engineer provided customer familiarization on the unit. Upon completion of the session, the truck was return to front line service

#### Hall County GA

7/22/14- Notification of de-scope of ladder during training exercise.

7/22/14- Sutphen recommended a complete product stand down to all customers that had Sutphen five section aerials in their fleet indicating limited utilization of the devices with no firefighters in the bucket until further investigation could be completed.

7/23-24/14- Sutphen technical personnel onsite to investigate cause of de-scope. Sutphen team interviewed the fire chief and staff to probe into the event and elements of the event (personnel in the bucket, angle, extension etc.). Due to the need to have a technical expert onsite to represent the county, only limited visual review was allowed on the first day. On the second day, County technical expert arrived as well as a representative of the cable manufacturer to assess the situation. Again, only limited access to the truck was allowed by all. Cables were removed from the aerial device for further inspection and photographs. Nothing stood out as the root cause during this investigation. Aerial device was bedded into the travel position. Truck was then impounded and secured in the maintenance shop until further investigation would be pursued.

9/4/14- A second review of the truck was initiated through NHTSA representative, including County's technical representative and County Commissioner. The investigation again was limited to pretty much the same routine as the previous inspection. Again, aerial device was bedded into the travel position. Truck was then impounded and secured in the maintenance shop until further investigation would be pursued.

10/28/14- Sutphen re-purchased the truck at Hall County's request and moved to a secure insurance impound building approximately 20 miles from the training center where it had been secured. This was executed through a settlement agreement between Hall County and Sutphen.

#### IV. The Remedy Program and Its Schedule

Describe the remedy program:



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Initial investigation and steps taken: All Sutphen customers and dealers were notified of the importance of proper maintenance and inspection. Contact information will be provided to answer questions and address any concerns. A core group of technicians were trained on the proper way to maintain and inspect the aerial ladder portion of the fire apparatus. These technicians visited every customer with one of the subject vehicles and provided them with information on proper maintenance and adjustment procedures. The technicians inspected the extend/retract components and noted any areas that need attention. All components that are deemed to be deficient will be repaired or replaced.

Coinciding with the actions taken to inspect, re-familiarize customers with proper maintenance and adjustment procedures as part of the field program, Sutphen engaged in a full blown design analysis of the current five section aerial design as manufactured utilizing both in-house engineering staff and outside engineering sources to assess the design.

### FIVE SECTION AERIAL RETROFIT PROGRAM

An engineering analysis has been performed to determine the root cause of some issues experienced with Section 3 extension cables on in-service SPH100 towers.

Subsequently a field-installable retrofit kit has been developed, analyzed, and tested to ensure that in-service aerials can be restored to a safe operating configuration.

This can be accomplished by increasing both size and strength of the Section 3 cables and limiting the maximum hydraulic pressure in the extension system. This modification kit will update the field units to meet Sutphen's standards and exceed NFPA requirements.

Although no known problems have occurred with the Section 4 & 5 cables, to ensure they provide the best operating safety margins, these cables are being upgraded to higher strength, swage compacted, cable of the same nominal sizes.

Design changes and components utilized in the upgrade include:

- Installed high strength Apex cables
- Increased size of the cables
- Redesigned sheaves and brackets to accommodate larger cables. Validated the pitch diameter meets engineering standards required for the wire rope industry.
- The sheave for the 1-3 cable assembly will now utilize a bearing manufactured by CJ Bearings in lieu of Polygon Composites
- The current dry film lubricant (McLube) is being changed to white lithium grease on aerial sections where contact is made between the slide blocks and aluminum extrusions.
- A more robust extend cylinder anchor bracket (picture frame) design has been incorporated
- Increased strength of anchor beams and associated structural components
- Installed a pressure relief valve to the hydraulic circuit on the extend/ retract cylinder
- Enhanced cable guidance system

Additionally a few slide pads are being reduced in length, and the slide pad lubricant is being changed (as noted above). Both of these modifications have been tested and proven to significantly reduce friction, thus reducing the maximum cable load requirements.

- Slide pads redesigned on sections 1-3
- Slide block material changed from Dri-slide material to UHMW
- Length of pads were reduced approximately 50%
- Leading edges were redesigned to improve distribution/ retention of the lubricant by adding a taper to both ends of the block.



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- New longitudinal grease galleys added to the slide block design to retain
- Grease pockets as the slide blocks transverse across the ladder sections

The entire retrofit package has been subjected to extensive testing, including simultaneous dynamic recording of Section 3 cable loads and hydraulic cylinder pressures during operation with the rated 1000 lb. bucket load. Cable loads were measured with calibrated load cells based transducers designed and manufactured specifically for the application.

- Calibrated load cells were installed on both the extend and retract cables in sections 1-3 to measure actual tensile force loads as these cables carry the total load of the machine and load in the bucket. Data was recorded throughout the test period.

- Hydraulic pressure of the extend cylinders were also measured through pressure transducers. Data was also recorded throughout the test period.

To further verify the design, the retrofitted SPH100 was subjected to an "accelerated- life" test comprising over 2000 repeated cycles at the full rated 1000 lb. capacity. The elevate, extend, lower, and retract cycle used was selected to produce maximum operating load on both the extension and the retraction cables for the 1000 lb. rated load case.

- The test plan was designed to operate the aerial device in a fully loaded (worst) condition for the entire life test with 1000 lbs. in the bucket.

- To our knowledge there are no U.S. standards to validate this life test. We researched and found European standards that indicated their guidelines. From this information we deduced that 1500 cycles would correlate to a 1 year life test under worse-case conditions.

- The test plan was designed to measure the performance in the worst conditions as it relates to maximum weight conditions and maximum coefficient of friction conditions. The worst conditions for each are extension at 50° and retraction at 0°. The aerial device was subjected to these conditions for the entire test

- Life testing continues currently. Based on the criteria noted above, currently we are approaching 1 ½ years in the life test program with no significant issues experienced.

- No major problems, component failures or other adverse results have been experienced during testing. Minor modifications were made to the aerial unit as we were proving out new design features.

#### Estimated Dates:

Previous events of activity after Green Valley for customer inspection program

Dealer Notification: Completed by 8/21/2012

Customer Notification: Completed by 8/21/2012

Training of Technicians: Completed by 2/1/2013

Field Visits of All Vehicles: Completed by 5/17/2013

New activity releasing campaign updates to modify trucks in the field

Parts shipments launched the week of 10/28/14

Schedule to complete modifications of all trucks in the field by 1/31/15

The field retrofit and customer upgrades have been launched to modify customer's trucks by factory trained Sutphen technicians and authorized dealer technicians. Sutphen has a complete customer listing of all units that will require modification.



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- We have established a complete set of work instructions to accomplish the required upgrades.
- The team of both factory and dealer technicians have been fully trained to install/ modify the products in the field prior to the launch.
- Upon completion of the modification, all customer trucks will undergo a third party inspection of the aerial device prior return to service.
- Field kits will be provided to ensure all components are available to complete the modification.
- Program has started in late October 2014
- Upgrades will be completed at no cost to the customer.

#### Distinguishing Characteristics:

Again on the initial customer investigation: since this was believed to be primarily a maintenance and inspection issue, there were no visible difference between vehicles that have been inspected versus those that are not. There are, however, visible signs that a vehicle is in need of repair. Sheaves that are off center and worn or broken strands of wire are some of the indicators that were noticed during a visual inspection.

#### Campaign Upgrades

The upgraded aerial device will be distinguishingly different. The increased cable size, more robust attaching components, hydraulic pressure limitation device and sheaves will be evident when upgrades are installed. These modifications should prevent unexpected retraction or de-scoping of the aerial device under foreseeable conditions, although acceptable vehicle maintenance and inspection practices by the user remain an essential component of insuring overall safety with regard to this equipment.

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